# FOCUSED SITE INSPECTION PRIORITIZATION
# SITE EVALUATION REPORT

## REXNORD, INC. ROCKFORD PRODUCTS CO.
## ALIAS: ROCKFORD PRODUCTS PLANT NO. 3
## 707 HARRISON AVENUE
## ROCKFORD, ILLINOIS

**CERCLIS ID NO.: ILD005212097**

Prepared for:

**UNITED STATES ENVIRONMENTAL PROTECTION AGENCY**
**SITE ASSESSMENT SECTION**
77 West Jackson Boulevard
Chicago, Illinois 60604

| | |
|---|---|
| Date Prepared: | August 18, 1995 |
| U.S. EPA Region: | 5 |
| Contract No.: | 68-W0-0037 |
| Technical Direction Document No.: | T05-9503-224 |
| Prepared by: | Ecology and Environment, Inc.<br>Donovan Robin |
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# 1. INTRODUCTION

The Ecology and Environment, Inc. (E & E), Technical Assistance Team (TAT) was assigned by the United States Environmental Protection Agency (U.S. EPA), under Contract No. 68-W0-0037, Technical Direction Document (TDD) No. T05-9503-224, to evaluate the Rexnord, Inc. Rockford Products Co. (Rexnord), alias Rockford Products Plant No. 3 site, in Rockford, Winnebago County, Illinois as a potential candidate for the National Priorities List (NPL). E & E performed Focused Site Inspection Prioritization (FSIP) activities to determine whether, or to what extent, the site poses a threat to human health and the environment, and has prepared this FSIP report. The report presents the results of E & E's evaluation and summarizes the site conditions and targets pertinent to the migration and exposure pathways associated with the site. Background information was obtained from the 1989 Illinois Environmental Protection Agency (IEPA) Screening Site Inspection (SSI) report for the Rexnord site, a 1995 Remedial Investigation Report for the Southeast Rockford Groundwater Contamination Study, and conversations with site representatives.

This report is organized into six sections, including this introduction. Section 2 describes the site and provides a brief site history. Section 3 provides information about previous investigations conducted at the site. Section 4 provides information about the four migration and exposure pathways (groundwater migration, surface water migration, soil exposure, and air migration). Section 5 is a summary of the FSIP. References used in the preparation of this report are listed in Section 6.

# 2. SITE DESCRIPTION AND HISTORY

The Rexnord site is located at 707 Harrison Avenue in Rockford, Winnebago County, Illinois (Sec. 2, T. 43 N., R. 1 E.). Coordinates for the site are latitude 42°14'05" North and longitude 089°05'00" West. The site is approximately 27 acres in area and includes an active manufacturing facility, a parking lot, and an open yard area. Between 1954 and 1976, the facility was owned by Rockford Products Company. The facility was purchased from the Rockford Products Company by Rexnord, Incorporated in 1976 and was sold to Rockford Products Corporation (RPC) in 1985.

The manufacturing facility has been used since 1954 for manufacture of screws, bolts, and other types of metal fasteners. Resource Conservation and Recovery Act (RCRA) hazardous wastes generated in the manufacturing process include spent halogenated solvents (RCRA waste code F002), spent non-halogenated solvents (F005), wastewater treatment sludges from electroplating operations (F005), and ignitable characteristic waste (D001) (Naill 1986). Other, non-hazardous wastes generated at the site includes waste oil. The facility also generated a waste cyanide solution (D003) until some time prior to 1985 (IEPA 1988).

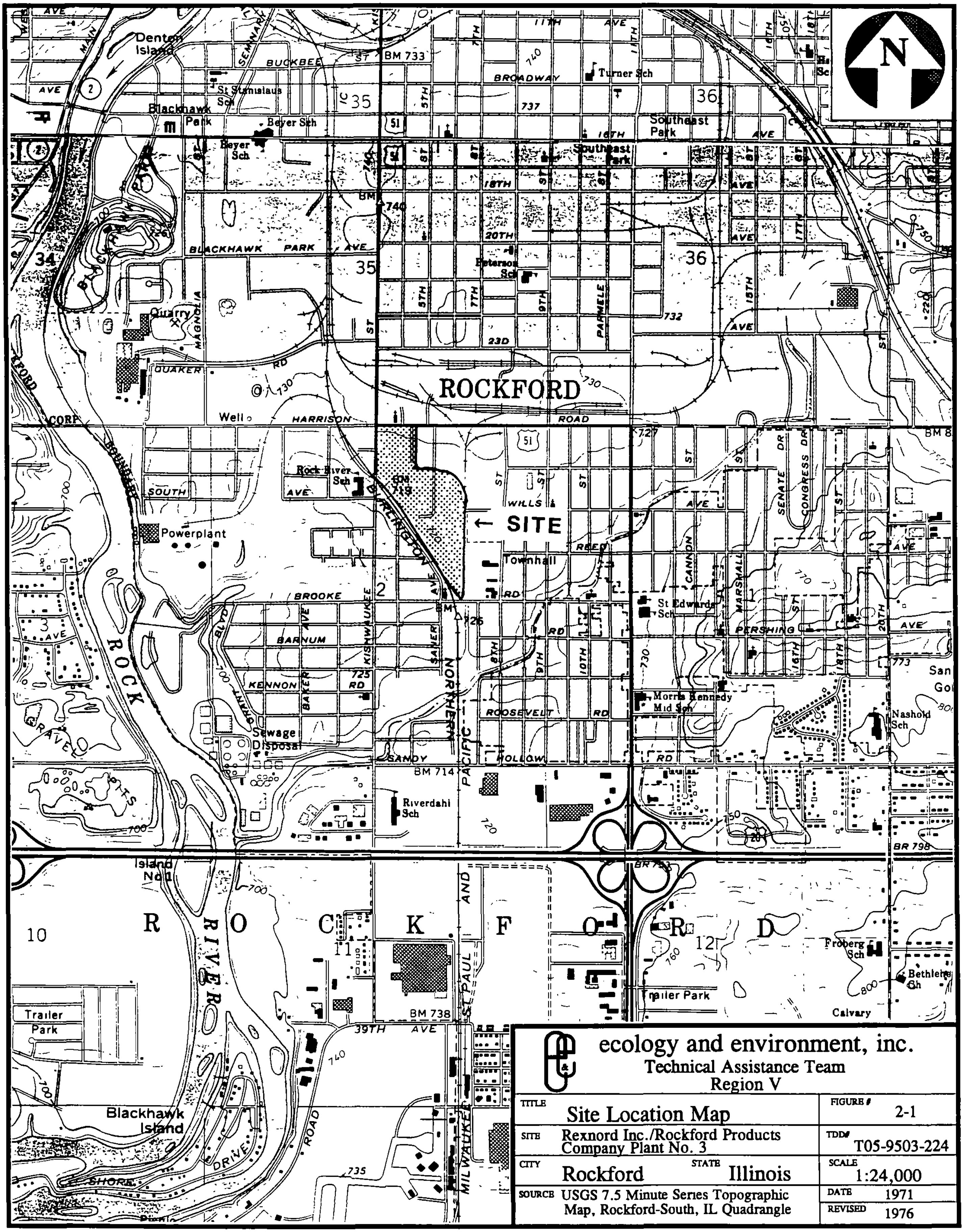
Waste management facilities on site include two drum storage areas, three underground storage tanks, an old waste oil incinerator, a new "Prenco" incinerator, a landfill, and a seepage pond (or drainage basin) (Shugart 1980; IEPA 1989).

The two drum storage areas, the three tank storage areas, and the Prenco incinerator were all certified closed by IEPA on March 22, 1989, in accordance with applicable RCRA regulations and an IEPA-approved work plan submitted on June 13, 1986 (Eastep 1989).

The old waste oil incinerator was used to burn waste oil, observations by IEPA inspectors indicate that the incinerator was taken out of commission some time prior to the establishment of formal closure procedures (Watson 1986; IEPA 1989).

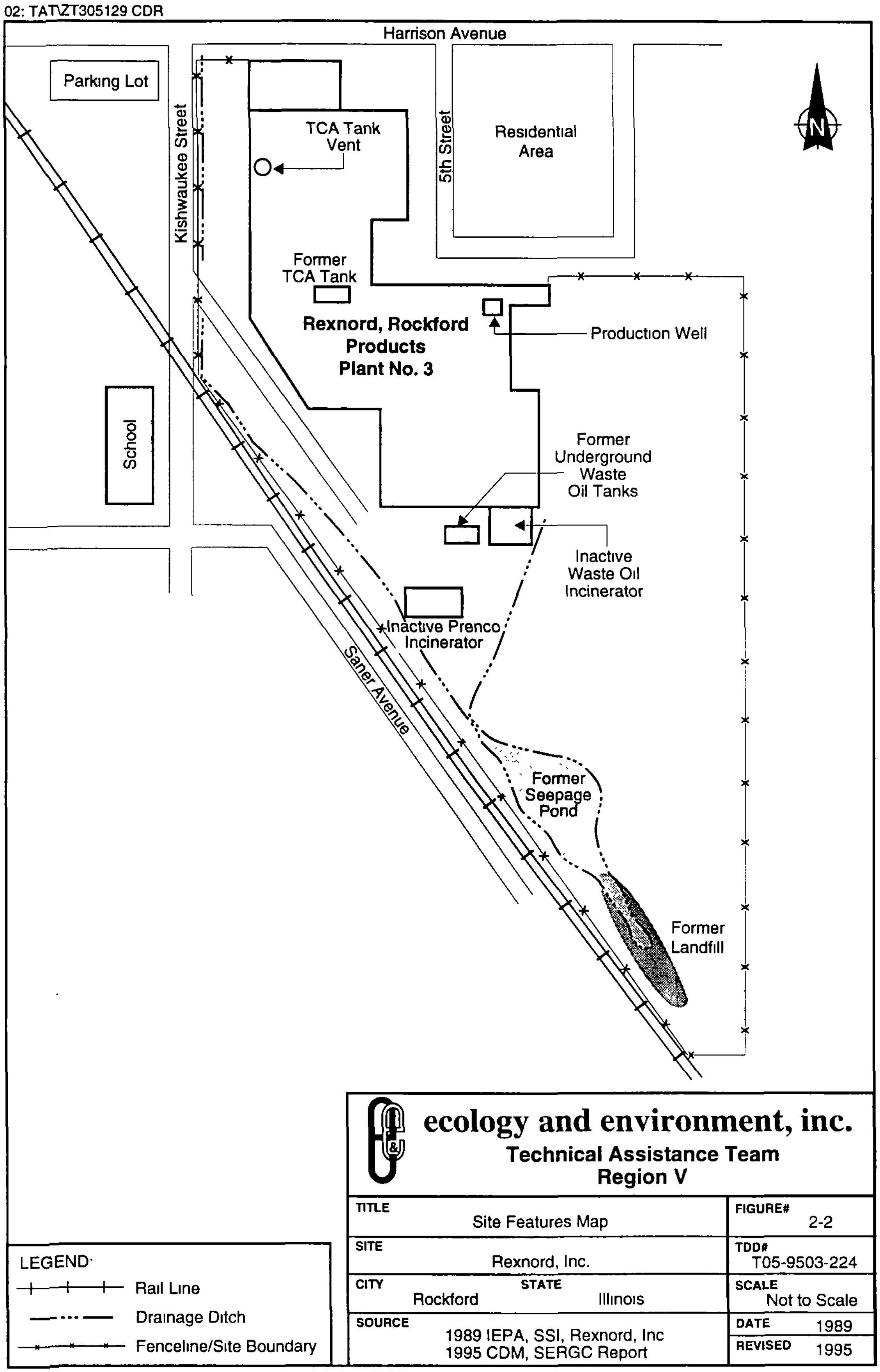
24-hour security (Cole 1995). Residential homes are located directly across from the site on Saner Avenue, Kishwaukee Avenue, and 5th Street. The Rockview Public School is located on South Street across from the west side of the site. A trucking company, a construction company, and an auto salvage yard are located southeast of the site (United States Geological Survey [USGS] 1976; IEPA 1989).

The site is located on nearly level ground. The Rock River is located one mile west of the site and is approximately 25 feet lower in elevation than the site (USGS 1976)




ecology and environment, inc.
Technical Assistance Team
Region V

| | | | |
|---|---|---|---|
| TITLE | Site Location Map | FIGURE # | 2-1 |
| SITE | Rexnord Inc./Rockford Products Company Plant No. 3 | TDD# | T05-9503-224 |
| CITY | Rockford STATE Illinois | SCALE | 1:24,000 |
| SOURCE | USGS 7.5 Minute Series Topographic Map, Rockford-South, IL Quadrangle | DATE | 1971 |
| | | REVISED | 1976 |


02: TAT\ZT305129 CDR
Harrison Avenue
Parking Lot
Kishwaukee Street
TCA Tank Vent
5th Street
Residential Area
N
Former TCA Tank
Rexnord, Rockford Products Plant No. 3
Production Well
School
Former Underground Waste Oil Tanks
Inactive Waste Oil Incinerator
Inactive Prenco Incinerator
Saner Avenue
Former Seepage Pond
Former Landfill
LEGEND:
Rail Line
Drainage Ditch
Fenceline/Site Boundary
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TITLE Site Features Map
FIGURE# 2-2
SITE Rexnord, Inc.
TDD# T05-9503-224
CITY Rockford
STATE Illinois
SCALE Not to Scale
SOURCE 1989 IEPA, SSI, Rexnord, Inc
1995 CDM, SERGC Report
DATE 1989
REVISED 1995

## 3. PREVIOUS INVESTIGATIONS

### 3.1 REXNORD SITE INVESTIGATIONS

In 1984, Rexnord, Inc. hired M. Rapps Associates (M. Rapps) to install monitoring wells and collect soil samples as a requirement of the permit for the seepage pond. VOCs including 1,1,1-TCA, trichloroethene (TCE), 1,1-dichloroethane (1,1-DCA), and trans-1,2-dichloroethane (1,2-DCA) were detected in surface water samples collected from the seepage pond and monitoring well samples collected near the pond (M. Rapps 1986).

In January 1988, M. Rapps completed a report for RPC which was submitted to IEPA. M. Rapps concluded that RPC was not responsible for the VOCs detected on site for the following reasons: the highest levels of VOCs on site, detected in the on-site production well, were attributable to off-site sources; and, the VOCs detected in the seepage pond and monitoring wells were attributable to discharge from the production well which drew groundwater from the contaminated aquifer (M. Rapps 1988).

A Preliminary Assessment (PA) was completed by IEPA for the Rexnord site on April 27, 1988. The PA identified a release of VOCs to groundwater, reports of waste disposal, and the proximity of the site to municipal wells as the main concerns at the site. The PA included on off-site reconnaissance which confirmed the presence of a fence and security at the site (IEPA 1988).

An SSI was conducted at the site by IEPA in September 1989. The SSI included collection of five monitoring well samples, one production well sample, one residential well sample, two subsurface and three surface soil samples, two sediment samples, and one surface water sample. Refer to Appendix B for a copy of the SSI sample location maps and analytical results summary (IEPA 1989).

units. In March 1989, RPC completed RCRA closure of these units with the approval of IEPA inspectors. Also, the old waste oil incinerator was withdrawn from the Part A application with the approval of IEPA (Eastep 1989).

Currently, the RPC facility maintains RCRA "large quantity generator" status for the facility (U.S. EPA 1995).

# 6. REFERENCES


Adam, Jack, July 18, 1995, Environmental Protection Specialist, Bureau of Water, IEPA, telephone conversation, contacted by Donovan Robin, E & E TAT, Chicago, Illinois.

Camp, Dresser and McKee, January 1995, *Southeast Rockford Groundwater Contamination Study, Remedial Investigation, Final Report,* Chicago, Illinois.

Cole, Nancy, June 8, 1995, Rockford Products Corporation, telephone conversation, contacted by Donovan Robin, E & E TAT, Chicago, Illinois.

Eastep, Lawrence, March 22, 1989, IEPA, letter, to David Peterson, Rockford Products Corporation.

Illinois Environmental Protection Agency, September 1989, *Screening Site Inspection Final Report, Rexnord, Inc. Site, U.S. EPA ID. No.: ILD005212097,* Springfield, Illinois.

______, April 27, 1988, *Preliminary Assessment, Final Report, Rexnord, Inc. Site, U.S. EPA ID No.: ILD005212097,* Springfield, Illinois

M. Rapps Associates, January 4, 1988, Groundwater Study Summary Letter, prepared for Rockford Products Corporation, Springfield, Illinois.

______, 1986, *Groundwater Monitoring Plan, Rockford Products Plant No. 3.*, Springfield, Illinois.

Morris, Roy, July 18, 1995, Rockford Products Corporation., Environmental Affairs Manager, letter, to Donovan Robin, E & E TAT, Chicago, Illinois.

______, June 14, 1995a, Rockford Products Corporation., Environmental Affairs Manager, letter, to Donovan Robin, E & E TAT, Chicago, Illinois.

Naill, Harold, December 23, 1986, Rockford Products Corporation, *Notification of Hazardous Waste Activity, Form 8700-12, U.S. EPA ID No.: ILD005212097,* Rockford, Illinois.

**APPENDIX A**

**FOUR MILE RADIUS MAP**

# 4. MIGRATION AND EXPOSURE PATHWAYS

This section describes the four migration and exposure pathways associated with the Rexnord site. Section 4.1 discusses the groundwater migration pathway; Section 4.2 discusses the surface water migration pathway; Section 4.3 discusses the soil exposure pathway; and Section 4.4 discusses the air migration pathway.

## 4.1 GROUNDWATER MIGRATION PATHWAY

This section discusses regional and site-specific geology and soils, groundwater releases, and targets associated with the groundwater migration pathway at the site.

### 4.1.1 Geology and Soils

The Rexnord site is located in the Rock River physiographic province which is characterized by rolling hills which reflect the surface of the underlying bedrock. Unconsolidated material overlying the bedrock consist of glacial deposits in upland areas and glacial deposits mixed with aluvial deposits near streams (CDM 1995). Drilling records indicate that the site is underlain by light-brown fine sand extending to at least 45 feet BGS. Unconsolidated deposits consisting mainly of sand and gravel with some layers of silt and clay extend to approximately 250 feet BGS in the vicinity of the site (USGS 1976; CDM 1995). These deposits are underlain by bedrock of the Ancell Group which consists primarily of St. Peter sandstone (CDM 1995). Soils on site are classified as urban land, which are areas largely covered with buildings and pavement and are generally well drained (United States Department of Agriculture [USDA] 1980).

Two aquifers exist beneath the site, one in the unconsolidated deposits (the upper aquifer), the other in bedrock (the deep aquifer); these aquifers are interconnected. Both

### 4.1.3 Targets

The nearest residential well to the site is located approximately 1,500 feet southeast of the seepage pond, near the corner of Eighth Avenue and Barnum Road; additional wells are located in areas generally south of the site. One well is located 0.7 miles southwest of the site, which is downgradient of groundwater flow. Sampling of these wells as part of the SRGCS has revealed VOC contamination in a number of these wells (CDM 1995), however this cannot be attributed solely to the Rexnord site.

The Rockford Municipal Water Company serves approximately 150,000 residents using over forty wells located within and outside the study area. A number of these wells have been affected by VOC contamination from a number of sources (CDM 1995). The nearest of these wells, UW14, located approximately 0.75 mile west of the site on Harrison Street, is no longer in operation (CDM 1995).

## 4.2 SURFACE WATER MIGRATION PATHWAY

The Rock River is located approximately 0.8 miles west of, and 30 feet below, the site (USGS 1976). The site is not located within the 500-year flood plain for the Rock River according to the 1989 SSI. Between 1954 and 1991, all runoff from the facilities on-site was collected in the on-site seepage pond and allowed to infiltrate to groundwater (IEPA 1989). In 1991, runoff was redirected toward a storm sewer owned by the City of Rockford. Discharge to the storm sewer is controlled under NPDES permit IL0067989 (Morris 1995). According to representatives of IEPA, RPC has had no violations of this permit (Adam 1995). This storm sewer is assumed to discharge to the Rock River.

The Rock River drains urban and agricultural areas in Wisconsin and northern Illinois and has a mean discharge of 4,000 cubic feet per second (USGS 1990). The river provides habitat for fishes and other aquatic organisms, but is not developed for drinking water (IEPA 1989). The topography and soils which occur along the banks of the river and on islands in the river, are favorable to wetland vegetation the nearest of these areas is located 0.8 miles southwest of the site (USDA 1980).

## 4.3 SOIL EXPOSURE PATHWAY

The site is reported to have a fence and locking gate and 24-hour security (Cole 1995). Information available indicates that no incidents of trespass onto the site or direct

# 5. SUMMARY

The FSIP for the Rexnord site has included a review of U.S. EPA and IEPA files for the site, a review of the SRGCS report, and conversations with RPC and IEPA representatives. A site reconnaissance and sampling was not necessary due to the completeness of the file information.

The Rexnord site is an active manufacturing facility where screws, bolts, and other fasteners have been manufactured since 1954. In 1986, VOCs were discovered in samples collected from a seepage pond used to contain runoff from the site. VOCs were also detected in samples collected from monitoring wells near the pond, and at very high levels in a production well on site. Further investigation conducted in the vicinity of the site by CDM for the SRGCS indicates that the greatest concentrations of VOCs detected on site are possibly coming from off-site sources, with lower levels coming from on-site sources. A number of residential and municipal wells have been affected by VOCs from a number of sources located in the site study area. These releases are currently being addressed as part of the SRGCS NPL site.

The site is located in a mixed residential/industrial area. The site is fenced and has 24-hour security. Runoff was formerly contained on site and released to groundwater, but is currently directed toward a city sewer and is covered by an NPDES discharge permit. No violations of air or sewer discharge permits have recently occurred according to IEPA. No documented removal of surface soil in the area of the former seepage pond and landfill have occurred. Approximately 900 persons work on site.

# SDMS US EPA Region V

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4-MILE RADIUS MAP

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## APPENDIX B

**SSI SAMPLE LOCATION MAPS AND ANALYTICAL RESULTS**

SOURCE: IEPA, 1989, SSI REPORT, REXNORD, INC., SITE.

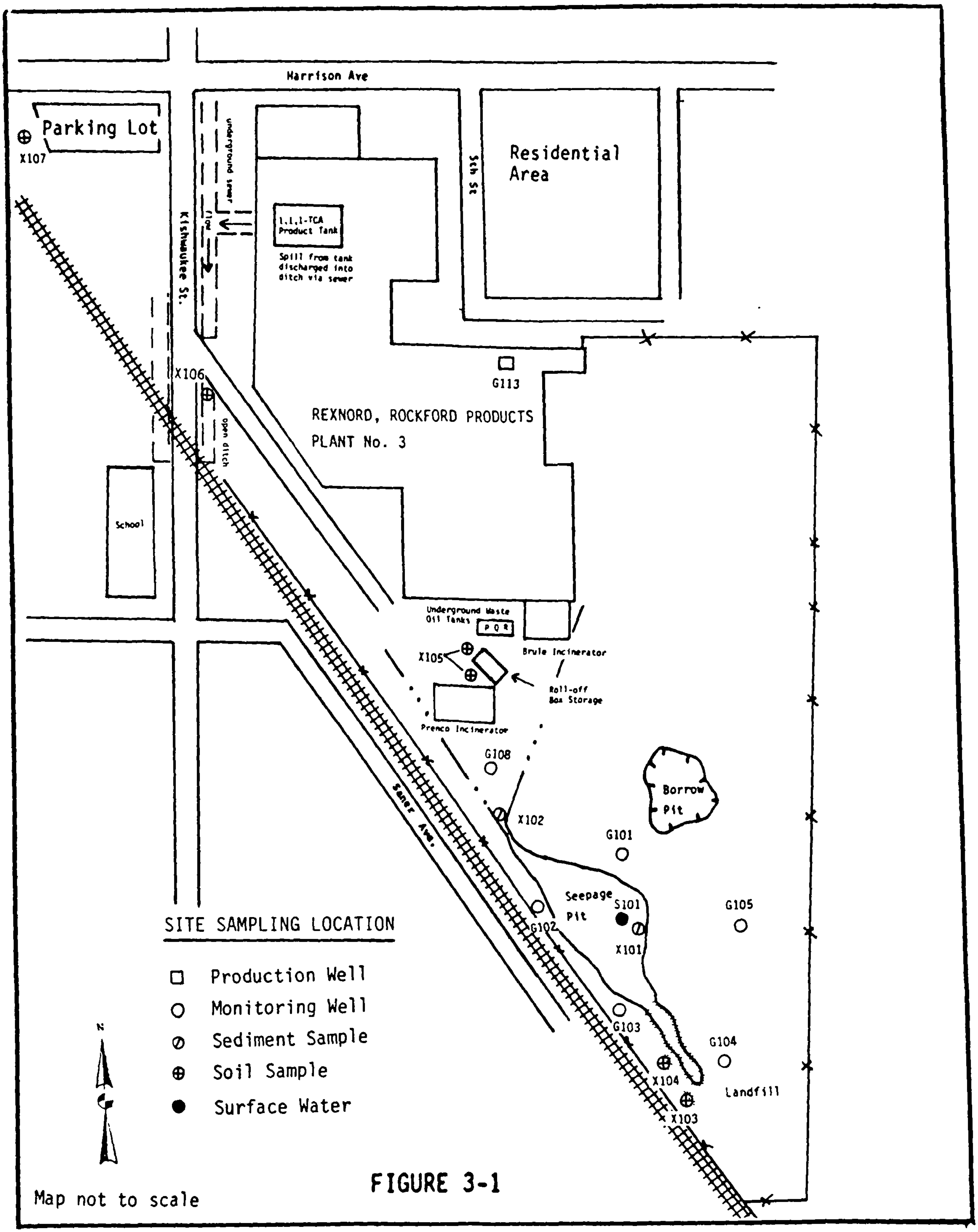
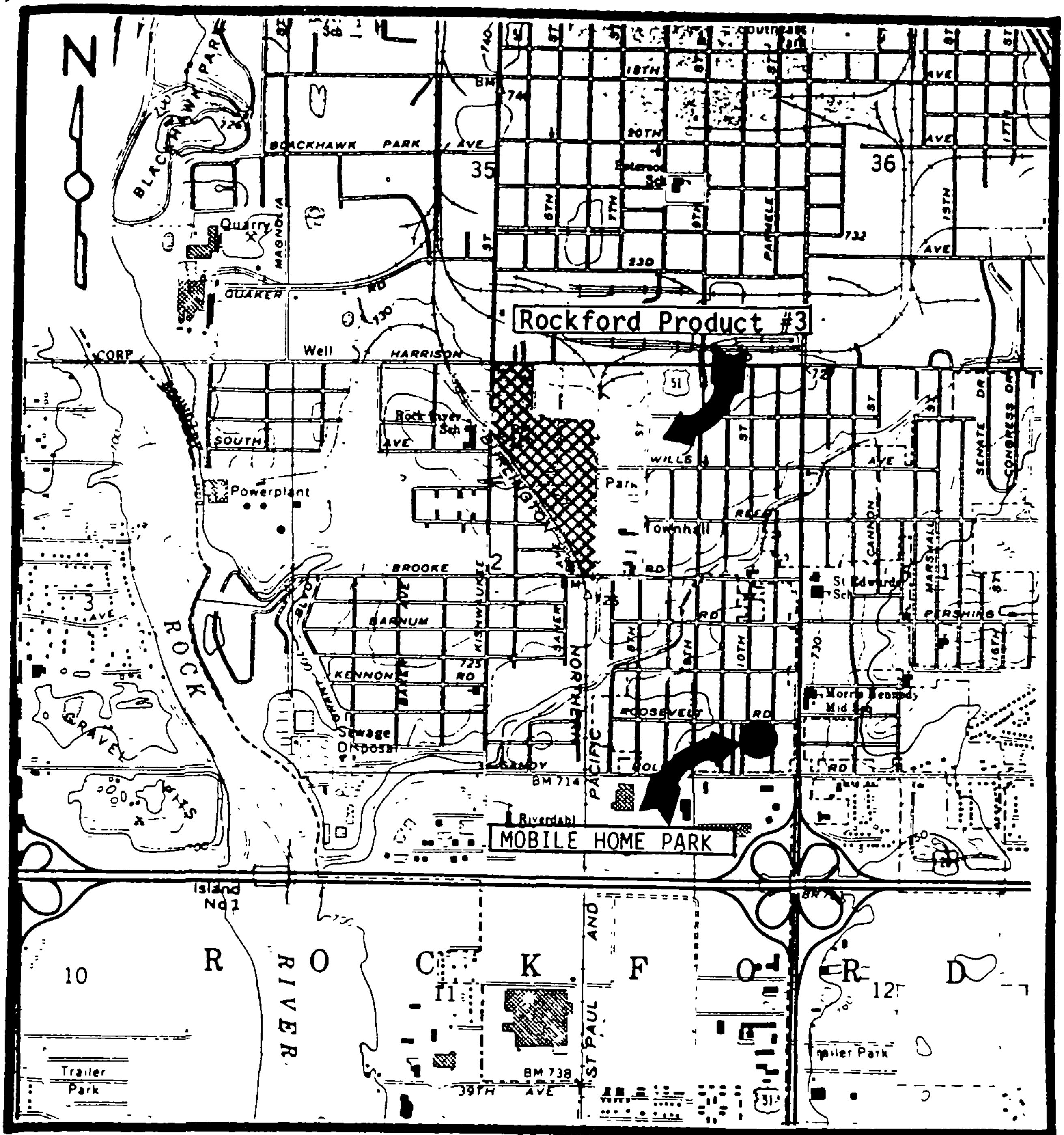



FIGURE 3-1

Source: IEPA,1989




ROCKFORD SOUTH QUADRANGLE
ILLINOIS
7.5 MINUTE SERIES (TOPOGRAPHIC)

SCALE 1 24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

FIGURE 3-2

REXNORD.ROCKFORD PRODUCTS COMPANY
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TABLE 4-1
SUMMARY

| | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Surface water | sed. | sed. | deep soil | deep soil | soil | sed. | [illegible] soil | | | | | | | [illegible] | |
| SAMPLING POINT | S 101 8-16-89 | X 101 8-16-89 | X 102 8-16-89 | X 103 8-16-89 | X 104 8-16-89 | X 105 8-16-89 | X 106 8-16-89 | X 107 8-16-89 | G 101 8-16-89 | G 102 8-16-8 | G 103 8-16-8 | G 104 8-16-8 | G 105 8-16-8 | G 108 8-16-8 | G 113 8-16-89 | G 201 8-16-89 | BLANK 8-16-89 |
| PARAMETER | | | | | | | | | | | | | | | | | |
| Beryllium | -- | -- | -- | -- | -- | -- | -- | 0.1 | 13.0 | 3.0 | 2.0 | 2.0 | -- | -- | -- | -- | -- |
| Cadmium | -- | -- | 2.0 | -- | -- | 6.3 | 1.4 | -- | 20.0 | -- | -- | -- | -- | -- | -- | -- | -- |
| Calcium | 103000.0 | 9700.0 | 24000.0 | 28000.0 | 45000.0 | 30000.0 | 49000.0 | 3000.0 | 76000.0 | 87000.0 | 58000.0 | 110000.0 | 70000.0 | 63000.0 | 100000.0 | 92000.0 | -- |
| Chromium | -- | 8.9 | 14.0 | 4.9 | 6.5 | 41.0 | 290.0 | 18.0 | 46.0 | -- | -- | -- | -- | 710.0 | -- | -- | -- |
| Cobalt | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Copper | 21.0 | 12.0 | 49.0 | 6.3 | 8.4 | 22.0 | 66.0 | 11.0 | 43.0 | 20.0 | -- | -- | -- | -- | -- | -- | -- |
| Iron | -- | 3400.0 | 3100.0 | 1800.0 | 2200.0 | 11000.0 | 5400.0 | 11000.0 | 790.0 | 80.0 | -- | -- | -- | 1900.0 | -- | -- | -- |
| Lead | -- | 8.9 | 37.0 | 2.2 | 3.0 | 22.0 | 540.0 | 23.0 | 5.1 | 2.0 | 1.0 | 1.8 | 1.6 | 5.9 | -- | 1.1 | -- |
| Magnesium | 40000.0 | 4100.0 | 5100.0 | 10000.0 | 18000.0 | 15000.0 | 25000.0 | 1600.0 | 31000.0 | 32000.0 | 26000.0 | 35000.0 | 23000.0 | 24000.0 | 40000.0 | 39000.0 | -- |
| Manganese | -- | 28.0 | 34.0 | 74.0 | 77.0 | 370.0 | 78.0 | 460.0 | 33.0 | 14.0 | -- | -- | -- | 98.0 | -- | -- | -- |
| Mercury | -- | -- | -- | -- | -- | -- | 0.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Nickel | -- | -- | -- | -- | -- | -- | -- | -- | 73.0 | -- | -- | 37.0 | -- | 110.0 | -- | -- | -- |
| Potassium | 2200.0 | 130.0 | 120.0 | 64.0 | 92.0 | 590.0 | 110.0 | 730.0 | 1400.0 | 3500.0 | 1500.0 | 2100.0 | 930.0 | 2300.0 | 2500.0 | 1400.0 | -- |
| Selenium | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 5.9 | -- | -- | -- | -- | -- |
| Silver | 17000.0 | -- | -- | -- | -- | -- | -- | -- | 25.0 | 11.0 | -- | 10.0 | -- | -- | 10.0 | -- | -- |
| Sodium | -- | 89.0 | 100.0 | 150.0 | 160.0 | 150.0 | 390.0 | 59.0 | 9000.0 | 12000.0 | 8300.0 | 17000.0 | 7400.0 | 7400.0 | 17000.0 | 32000.0 | -- |
| Thallium | -- | -- | -- | -- | -- | -- | -- | -- | 3.0 | -- | -- | -- | -- | -- | -- | -- | -- |
| Vanadium | -- | 5.7 | 4.6 | -- | -- | 19.0 | 4.3 | 28.0 | 20.0 | -- | -- | -- | -- | -- | -- | -- | -- |
| Zinc | 22.0 | 67.0 | 140.0 | 28.0 | 14.0 | 200.0 | 190.0 | 62.0 | 40.0 | -- | -- | -- | -- | -- | -- | 25.0 | -- |
| Cyanide | -- | -- | -- | -- | -- | 5.2 | 3.3 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Sulfate | 60000.0 | 270.0 | 160.0 | 220.0 | 250.0 | 41.0 | 100.0 | 47.0 | 36000.0 | 60000.0 | 27000.0 | 53000.0 | 14000.0 | 20000.0 | 58000.0 | 34000.0 | -- |
| Sulfide | -- | 300.0 | 520.0 | 190.0 | 180.0 | 78.0 | 510.0 | 250.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| TEMPERATURE | | | | | | | | | 70.6 | -- | 69.5 | 53.8 | 55.3 | 61.9 | 55.9 | 53.8 | -- |
| SP. COND.(umhos) | | | | | | | | | 0.6 | -- | 0.6 | 1.0 | 0.7 | 0.5 | 0.9 | 0.9 | -- |
| PH | | | | | | | | | 7.6 | -- | 7.9 | 7.7 | 7.7 | 7.9 | 7.9 | 8.2 | -- |

PEINOPD, ROCKFORD PRODUCTS COMPANY
ILD 005212097

TABLE 4-1
SUMMARY

| SAMPLING POINT / PARAMETER | S 101 8-16-89 | X 101 8-15-89 | X 102 8-16-89 | X 103 8-16-89 | X 104 8-16-89 | X 105 8-16-89 | X 106 8-16-89 | X 107 8-16-89 | G 101 8-16-89 | G 102 8-16-8 | G 103 8-16-8 | G 104 8-16-8 | G 105 8-16-8 | G 108 8-15-8 | G 113 8-16-89 | G 201 8-16-89 | BLANK 8-16-89 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| VOLATILES (ppb) | | | | | | | | | | | | | | | | | |
| Chloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Bromomethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vinyl Chloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Methylene Chloride | 15.0 | 35.0 | 54.0 | 14.0 | 16.0 | 27.0 | 32.0 | -- | -- | 25.0 I | -- | 11.0 B | 22.0 I | -- | -- | -- | 11.0 B |
| Acetone | -- | 32.0 J | 31.0 J | -- | 17.0 J | 20.0 J | 50.0 I | 23.0 J | -- | 69.0 | -- | 48.0 | 70.0 | -- | -- | -- | -- |
| Carbon Disulfide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1-Dichloroethene | 46.0 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | 7.0 | -- | -- | -- | 70.0 | -- | -- |
| 1,1-Dichloroethane | 43.0 | 8.0 | 9.0 | -- | -- | -- | -- | -- | 12.0 | -- | 9.0 | 8.0 | -- | -- | 65.0 | -- | -- |
| 1,2-Dichloroethene(total) | 44.0 | -- | -- | -- | -- | -- | -- | -- | 7.0 | -- | 8.0 | 6.0 | -- | -- | 61.0 | -- | -- |
| Chloroform | -- | -- | 6.0 I | -- | -- | -- | 10.0 | 11.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2-Dichloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Butanone (MEK) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,1-Trichloroethane | 75.0 | 44.0 | 70.0 | 23.0 | -- | -- | -- | -- | 11.0 | -- | 14.0 | 10.0 | -- | -- | 130.0 | -- | -- |
| Carbon Tetrachloride | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Vinyl Acetate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Bromodichloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2-Dichloropropane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| cis-1,3-Dichloropropene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Trichloroethene | 26.0 | -- | -- | -- | -- | 7.0 | -- | -- | 5.0 | -- | 8.0 | 5.0 J | -- | -- | 50.0 | -- | -- |
| Dibromochloromethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,2-Trichloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzene | -- | -- | -- | 16.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Trans-1,3-Dichloropropene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Bromoform | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Methyl-2-Pentanone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Hexanone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Tetrachloroethene | 6.0 | -- | -- | -- | -- | 4.0 J | -- | -- | -- | -- | -- | -- | -- | -- | 13.0 | -- | -- |
| Toluene | -- | -- | -- | 30.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,1,2,2-Tetrachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Chlorobenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | 2.0 J | -- | -- | -- | -- | -- | -- |
| Ethylbenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Styrene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Xylene (o&p) | -- | 13.0 J | -- | 13.0 J | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| xylene (m) | | | | 12.0 | | | | | | -- | -- | -- | -- | -- | -- | -- | -- |
| SEMIVOLATILES (ppb) | | | | | | | | | | | | | | | | | |
| Phenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Chloroethyl) ether | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Chlorophenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,3-Dichlorobenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,4-Dichlorobenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzyl Alcohol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2-Dichlorobenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Methylphenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

REXNORD,ROCKFORD PRODUCTS COMPANY
ILD 005212097

TABLE 4-1
SUMMARY

| SAMPLING POINT | S 101 | X 101 | X 102 | X 103 | X 104 | X 105 | X 106 | X 107 | G 101 | G 102 | G 103 | G 104 | G 105 | G 108 | G 113 | G 201 | BLANK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 8-16-89 | 8-16-89 | 8-16-89 | 8-16-89 | 8-16-89 | 8-16-89 | 8-16-89 | 8-16-89 | 8-16-89 | 8-16-8 | 8-16-8 | 8-16-8 | 8-16-8 | 8-16-8 | 8-16-89 | 8-16-89 | 8-16-89 |
| PARAMETER | | | | | | | | | | | | | | | | | |
| bis(2-Chloroisopropyl)ether | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Methylphenol | -- | -- | -- | -- | - | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| N-Nitroso-di-n-Dipropylamine | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Hexachloroethane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Nitrobenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Isophorone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Nitrophenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2,4-Dimethylphenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzoic acid | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2Chloroethoxy) Methane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2,4-Dichlorophenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 1,2,4-Trichlorobenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Naphthalene | -- | -- | -- | -- | -- | -- | 25000.0 JD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Chloroaniline | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Hexachlorobutadiene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Chloro-3-Methylphenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Methylnaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Hexachlorocyclopentadiene | -- | -- | -- | -- | -- | -- | 6100.0 JD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2,4,6-Trichlorophenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2,4,5-Trichlorophenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Chloronaphthalene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2-Nitroaniline | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dimethylphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthylene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2,6-Dinitrotoluene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 3-Nitroaniline | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Acenaphthene | -- | -- | -- | -- | -- | -- | 57000.0 D | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2,4-Dinitrophenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Nitrophenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenzofuran | -- | -- | -- | -- | -- | -- | 35000.0 JD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 2,4-Dinitrotoluene | -- | -- | -- | -- | -- | -- | - | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Diethulphthalate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Chlorophenyl-phenyl ether | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluorene | -- | -- | -- | -- | -- | -- | 50000.0 D | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Nitroaniline | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,6-Dinitro-2-Methylphenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| N-Nitrosodiphenylamine | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4-Bromophenyl-phenylether | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Hexachlorobenzene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pentachlorophenol | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Phenanthrene | -- | -- | -- | -- | -- | -- | 380000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Anthracene | -- | -- | -- | -- | -- | -- | 540000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Di-n-Butylphthalate | -- | -- | -- | -- | -- | -- | 48000.0 UD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Fluoranthene | -- | -- | -- | -- | -- | -- | 400000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Pyrene | -- | -- | -- | -- | -- | -- | 340000.0 DJ | 74.0 J | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Butylbenzylphthalate | -- | -- | -- | -- | -- | -- | 48000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 3,3'-Dichlorobenzidine | -- | -- | -- | -- | -- | -- | 36000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)anthracene | -- | -- | -- | -- | -- | -- | 120000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |

REXNORD, ROCKFORD PRODUCTS COMPANY
ILD 005212097

TABLE 4-1
SUMMARY

| SAMPLING POINT | S 101 8-16-89 | X 101 8-16-89 | X 102 8-16-89 | X 103 8-16-89 | X 104 8-16-89 | X 105 8-16-89 | X 106 8-16-89 | X 107 8-16-89 | G 101 8-16-89 | G 102 8-16-8 | G 103 8-16-8 | G 104 8-16-8 | G 105 8-16-8 | G 108 8-16-8 | G 113 8-16-89 | G 201 8-16-89 | BLANK 8-16-89 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| PARAMETER | | | | | | | | | | | | | | | | | |
| Chrysene | -- | -- | -- | -- | -- | -- | 150000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| bis(2-Ethylhexyl)phthalate | -- | -- | -- | 240.0 J | -- | 280.0 J | 48000.0 DJ | 270.0 J | 3.0 J | -- | 1.0 J | 1.0 J | -- | -- | -- | -- | -- |
| Di-n-Octylphthalate | -- | -- | -- | -- | -- | -- | 48000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(b)fluoranthene | -- | -- | -- | -- | -- | -- | 110000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(k)fluoranthene | -- | -- | -- | -- | -- | -- | 60000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(a)pyrene | -- | -- | -- | -- | -- | -- | 120000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Indeno(1,2,3-cd)pyrene | -- | -- | -- | -- | -- | -- | 110000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dibenz(a,h)anthracene | -- | -- | -- | -- | -- | -- | 48000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Benzo(g,h,i)perylene | -- | -- | -- | -- | -- | -- | 100000.0 DJ | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| PESTICIDES (ppb) | | | | | | | | | | | | | | | | | |
| alpha-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| beta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| delta-BHC | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-BHC (Lindane) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Heptachlor epoxide | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Endosulfan I | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Dieldrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDE | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Endrin | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Endosulfan II | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDD | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Endosulfan sulfate | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| 4,4'-DDT | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Methoxychlor (Marlate) | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Endrin ketone | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| alpha-Chlorodane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| gamma-Chlorodane | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Toxaphene | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1016 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1221 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1232 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1242 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1248 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1254 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Aroclor-1260 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| INORGANICS (soil samples ppm..water samples ppb) | | | | | | | | | | | | | | | | | |
| Aluminum | 230.0 J | 2700.0 | 1800.0 | 920.0 | 830.0 | 7800.0 | 2100.0 | 120000.0 | 670.0 | -- | -- | -- | -- | 850.0 | -- | -- | -- |
| Antimony | -- | -- | 11.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Arsenic | -- | -- | -- | -- | -- | 1.7 | 2.1 | 3.6 | -- | -- | -- | -- | -- | -- | -- | -- | -- |
| Barium | -- | -- | 45.0 | -- | -- | 94.0 | 38.0 | 130.0 | -- | -- | -- | -- | -- | -- | -- | -- | -- |

**APPENDIX C**

**SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY, SELECTED SECTIONS**

SOURCE: CDM, JANUARY 1995, REMEDIAL INVESTIGATION REPORT, SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY

# Section 1
# Introduction

The primary purpose of this Remedial Investigation (RI) Report is to present and interpret the results from the Phase II field activities for the Southeast Rockford Groundwater Contamination Study conducted from January 1993 through January 1994.

The Phase II field activities were designed to achieve the following objectives:

- Review historical information on potential source areas identified prior to Phase II;
- Provide preliminary screening information for the identified source areas;
- Define the extent of groundwater contamination within the Phase II study area;
- Evaluate contaminant migration pathways between source areas and the study area;
- Evaluate the potential for non-aqueous phase liquids in the subsurface;
- Monitor volatile organic vapors in residential basements located in areas of elevated contaminant concentrations in shallow groundwater;
- Evaluate the risk to residents with drinking water wells within the Operable Unit study area; and
- Gather data for a groundwater model to be used to assist with plume definition, source area location, and evaluation of remedial alternatives.

This investigation was not designed to identify new source areas.

Phase II field activities included a soil gas survey of twelve potential source areas, soil boring installation and sampling, monitoring well installation and sampling, residential well sampling, residential air sampling and Source Area 7 test pit soil and ambient air sampling. During the Phase II field activities, 212 soil gas points were sampled, 44 monitoring wells were installed, 55 subsurface soil borings were drilled, 116 subsurface and 10 surface soil samples were collected, 165 groundwater samples were collected from monitoring wells, 24 groundwater samples were collected from residential wells, 20 residential air samples were collected, and two test pits were excavated in the study area.

An additional objective of this RI Report is to assimilate the data collected by IEPA/CDM from the Operable Unit, Phase I and Phase II studies, USGS, and work conducted by individual facilities throughout the study area into one report to be used to support the Feasibility Study (FS) and Record of Decision (ROD).

## 1.1 Study Area Description

The Southeast Rockford Groundwater Contamination study area is located in southeast Rockford in Winnebago County, and covers approximately 10 square miles. The study area is bounded by Broadway to the north, Sandy Hollow Road to the south, Mulford Road in the eastern portion of Section 4 to the east, and the Rock River to the west. The workplan describes the eastern boundary as Wendy Lane, however this was adjusted to Mulford Lane to provide a main roadway for the eastern boundary.

The study area is predominantly an urban and suburban residential area, which includes scattered industrial, agricultural, retail and commercial operations. A small industrial park is located in the central portion of the study area in the vicinity of Laude Drive and 22nd Street. Other industrial areas are situated in the vicinity of Harrison Avenue and Alpine Road, Sandy Hollow Road and Alpine Road, near the Rock River in the northwest and elsewhere in the study area. Agricultural areas are present in the southeastern portion of the study area, as well as areas to the east and south of the study area. A larger scale map of the study area is included as Plate 1-1 at the back of this volume. This map may be used throughout the report to locate pertinent site features not detailed on smaller scale maps.

The study area is predominantly flat-lying and slopes gently westward towards the Rock River, but locally contains low-relief hilly areas. Maximum topographic relief across the study area is approximately 160 feet. A small concrete-lined drainage ditch runs across the western portion of the study area and discharges to the Rock River in the southwestern corner. A review of 117 IDPH well construction reports established that the majority of the residential wells in the western part of the study area were screened in the 40-feet to 70-feet range in a sand and gravel aquifer. However, few residential wells are present in the portion of the study area east of 24th Street. Although deeper residential wells exist in the study area, no systematic distribution of the deeper wells is evident. A review of data from City of Rockford municipal wells established the local stratigraphy in deeper portions of the subsurface, and showed the penetration of low contaminant concentration to those depths.

The study area has been expanded in all directions from the boundaries which were used to score the site for inclusion on the United States Environmental Protection Agency's (USEPA's) National Priorities List (NPL), because sampling results have indicated that the plume of contaminated groundwater extends beyond the original NPL site boundaries. The original NPL boundaries were 8th Street to the west, Sawyer Road to the south, 21st Street to the east, and Harrison Avenue to the north (Figure 1-1).

The stratigraphy of the study area consists of bedrock with locally significant subsurface relief that is overlain by unconsolidated glacial sediments of variable thickness. The uppermost bedrock unit is generally dolomite, which forms a subsurface valley greater than 200 feet deep in the western part of the study area. Glacial sediments are thickest within this bedrock valley and thinnest on the valley flanks. The glacial sediments and the bedrock constitute two hydraulically-connected aquifers; no areally extensive aquitards have been identified between the unconsolidated deposits and the dolomite.

## 1.2 Study Area History

Groundwater contamination by volatile organic compounds (VOCs) was initially discovered by the Rockford Water Utility (RWU) in 1981. Four municipal wells in Southeast Rockford were taken out of service in December 1981 due to the contamination. In 1982, the city discovered that additional wells were contaminated and subsequently closed down these wells. Within the study area, municipal Unit Well 35, located near Ken Rock Playground (Bildahl Street and Reed Avenue), was found to be contaminated during a routine sampling of the well in 1984; the well was tested for 33 priority pollutants and several VOCs were detected. Because contaminants were present at levels above the Safe Drinking Water Act Maximum Contaminant Level (MCL), the well was taken out of service in 1985. During the "operable unit remedial action" conducted by USEPA (July 1991 to November 1991) a granular activated carbon treatment system was installed at Unit Well 35. The well is now pumped periodically based on service demand.

IEPA discovered that VOCs were present in Southeast Rockford's water in 1984 as a result of a report that plating wastes were being illegally disposed of in a well located at 2613 South 11th Street. In October 1984, IDPH initiated an investigation that involved sampling 49 wells in the vicinity of this well. While the investigation did not find significant levels of contaminants commonly associated with plating wastes, it did report high levels of chlorinated solvents, which were also detected in the City of Rockford's municipal well. IDPH conducted four separate sampling investigations involving residential wells in the Southeast Rockford area: 49 samples were collected in 1984, 43 samples in 1985, 17 in 1988, and 267 in 1989. For the most part, sample locations varied during the separate sampling investigations; however, in some cases, wells were sampled more than once.

In 1986, the Illinois State Water Survey (ISWS) completed a project which involved a regional characterization of groundwater quality in Rockford. The study indicated that groundwater samples from public and private wells in the Southeast Rockford area contained significant concentrations of VOCs. Seven private well sites sampled in the Southeast Rockford area as part of the study contained greater than 10 µg/l total VOCs; five of those seven contained greater than 100 µg/l total VOCs. One of the private wells containing greater than 100 µg/l total VOCs was located near the Rock River (Wehrmann, 1988).

As a result of sampling events by state and federal agencies, the Southeast Rockford site was proposed for inclusion on the NPL in June 1988 and was added to the NPL in March 1989 as a state-lead, federally-funded Superfund site. Throughout 1989, the USEPA Technical Assistance Team (TAT) sampled 112 residential wells in the Southeast Rockford area and tested for the following abbreviated list of VOCs:

- Trichloroethene
- cis-1,2,-Dichloroethene
- 1,2-Dichloroethane
- 1,1,1-Trichloroethane
- trans-1,2-Dichloroethene, and
- 1,1-Dichloroethane

In August 1989, the USEPA initiated a time critical removal action under which bottled water was offered as a temporary measure to residents whose well water analysis results revealed VOC levels greater than or equal to 25 percent of the Removal Action Level (RAL). In mid-December 1989, these residences were equipped with carbon filters as an intermediate solution to the problem. USEPA ultimately extended water mains and provided hookups to city water to 283 residences between June and November 1990.

During June 1990, Camp Dresser & McKee (CDM), under the direction of IEPA, conducted a groundwater sampling investigation of 117 private wells in Southeast Rockford as part of the Operable Unit Remedial Investigation. The objective of this sampling was to see if any homes had wells with levels of VOCs below the time critical removal action cutoff, but above MCLs. The IEPA sampling revealed an additional 243 homes that needed to be connected to the City of Rockford's municipal water supply system.

The Proposed Plan for this Operable Unit was released to the public in March 1991 and included the connection of the affected homes to the municipal supply and the construction of a granular activated carbon (GAC) treatment facility for municipal Unit Well 35. The Record of Decision (ROD) was signed in June 1991.

The Operable Unit was established under the removal program in order to complete construction during 1991. By November 1991, 264 homes were connected to city water. By November 1992, the GAC unit was completely operational and available to assure sufficient service capacity for the area.

From May to October of 1991, CDM and its subcontractors, under the direction of IEPA, conducted the Phase I Remedial Investigation. In Phase I, the study area was expanded from the original NPL site boundaries to an area of approximately 5 square miles. The Phase I area was bounded on the north by Harrison Avenue, on the south by Sandy Hollow Road, Wendy Lane to the east and the Rock River to the west. Phase I activities included a 225-point soil gas survey, installation of 33 monitoring wells at 11 locations, hydraulic conductivity testing, sampling and analysis of the 33 Phase I wells, 19 Illinois State Water Survey (ISWS) wells and 16 industrial wells, and subsurface soil sampling during drilling. The Phase I study was designed to define the nature and distribution of groundwater contamination, define local geology and hydrogeology, and to gain preliminary information on potential contaminant source areas.

The results of the Phase I investigation indicated two areas of groundwater contamination of volatile organic compounds, including one area located near the industrial facility southeast of the intersection of Harrison Avenue and Alpine Road, and a larger area near and down-gradient (west-northwest) from well nest MW106 (see Figure 3-11). Near the downgradient extent of this plume, several plumes, possibly related in part to the larger plume, are located west and southwest of MW20.

Based on elevated VOC concentrations in soil gas or groundwater, eight (8) potential source areas were also identified during the Phase I Investigation, as follows: 1) upgradient from well nest MW106 (Area 7); 2) upgradient from well nest MW101 (Areas 5 and 6); 3) at the industrial facility southeast of Harrison Avenue and Alpine Road (Area 8); and 4) several discrete locations in industrial areas in the western part of the study area (Areas 1 through 4). At the conclusion of the Phase I field activities a Technical Memorandum was prepared.

Subsequent to Phase I, CDM examined information on industrial operations and defined additional potential source areas that were proposed for investigation during Phase II. These areas were identified as Areas 9 through 14 (see Figure 4-1). The information examined included IEPA files from the Rockford office, and information on facility practices provided to the USEPA by industrial enterprises, under an ongoing enforcement action.

In March 1992, USEPA and IEPA conducted a preliminary geophysical survey of Potential Source Areas 6 and 7 that were identified in the Phase I Technical Memorandum. This survey was prompted by reports of illegal dumping in Area 7 and the results of groundwater samples collected during Phase I from MW106, 108 and 109.

Based on the preliminary results of the March 1992 survey, a more detailed investigation was performed by CDM and USEPA in May 1992 in Area 7. The investigation included a terrain conductivity survey, a ground-penetrating radar survey and a soil gas survey (see Figure 4-3). Survey results indicated the presence of buried magnetic anomalies and VOCs in the soil gas, primarily in the area of Ekberg Park (in Area 7).

The Phase II scoping activities began in the summer of 1992. The objectives of Phase II included: 1) filling data gaps identified in Phase I; 2) providing sufficient information on potential source areas to allow an evaluation of need for future work; 3) gathering sufficient information to expand the groundwater model; and 4) gathering sufficient information to support a risk assessment and feasibility study.

The Phase II field activities were conducted from January 1993 to January 1994.

## 1.3 Organization of the Report

Section 2 of this report describes the analytical and field protocol used during the field activities. The results of the hydrogeologic investigation are discussed in Section 3. Section 4 details the results of the contaminant investigation. The groundwater modeling procedures, assumptions and results are presented in Section 5. Section 6 contains the risk assessment for residential wells. Conclusions and recommendations are detailed in Section 7 and references are provided in Section 8.

# Section 3
# Results of Hydrogeologic Investigation

This section of the remedial investigation report presents and interprets the findings of the Phase I and Phase II hydrogeologic investigations. The field methods and procedures used to obtain the results have been described in the preceding sections.

## 3.1 Geology

### *3.1.1 Geology of Winnebago County*

The city of Rockford is located in the southwestern portion of Winnebago County, Illinois. The county lies within the Rock River Hill Country physiographic province and is marked by rolling topography with elevations ranging from about 700 feet above mean sea level (MSL) in Rockford to over 900 feet MSL in other parts of the county. Several rivers and creeks are found in the county's watersheds, most of which drain into the Rock River, which flows in a predominantly north to south direction, ultimately emptying into the Mississippi River.

Subsurface sediments in Winnebago county are predominantly unconsolidated glacial sediments with lesser amounts of river-deposited sediments predominating in river and creek floodplains. River sediments mostly overlie glacial sediments. The glacially-derived sediments unconformably overlie a highly-eroded bedrock surface that ranges in elevation from less than 450 to over 900 feet above MSL. Pre-glacial bedrock valleys occur within the county. The bedrock valley found near the Rockford area is the Rock Bedrock Valley which trends north to south near the eastern edge of the county; another major bedrock valley (the Troy Bedrock Valley) which trends northeast to southwest, is found east of Rockford (Berg et al., 1984).

The topography and physiography of the county is generally controlled by the subsurface topography of the bedrock. Surface highlands reflect subsurface bedrock areas of higher elevation and river valleys and creeks reflect the subsurface valleys.

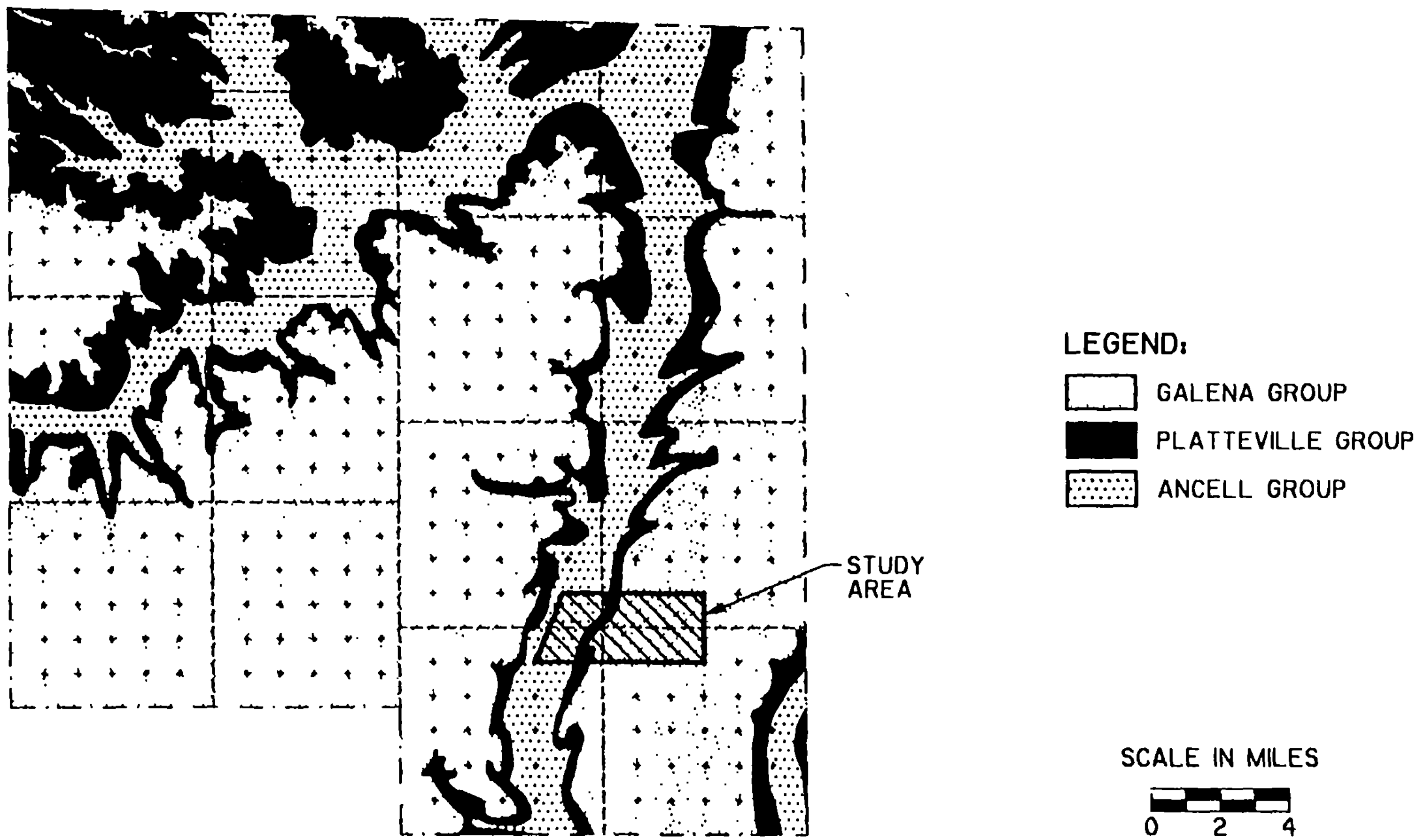
Paleozoic bedrock units found in Winnebago County include the Galena, Platteville, Ancell, and Prairie du Chien Groups; these strata overlie Cambrian Formations which overlie Pre Cambrian granite. Silurian dolomite and the Maquoketa Group are not present in the study area. Bedrock surfaces in the Troy and Rock Bedrock Valleys are predominantly the Ancell Group, with bedrock of younger age found as the flanks of the valleys. Since this region is part of the southeastern flank of the Wisconsin arch, the bedrock units have a regional dip to the southeast. A generalized stratigraphic column of Winnebago County is found as Figure 3-1, a bedrock surface map is found as Figure 3-2.

| ERA | SYSTEM | SERIES | MEGA-GROUP | GROUP | FORMATION |
|---|---|---|---|---|---|
| CENOZOIC | QUATERNARY | PLEISTOCENE | | | |
| PALEOZOIC | ORDOVICIAN | CHAMPLAINIAN | OTTAWA | GALENA | DUBUQUE |
| | | | | | WISE LAKE |
| | | | | | DUNLEITH |
| | | | | | GUTTENBERG |
| | | | | PLATTEVILLE | QUIMBYS MILL |
| | | | | | NACHUSA |
| | | | | | GRAND DETOUR |
| | | | | | MIFFLIN |
| | | | | | PECATONICA |
| | | | | ANCELL | GLENWOOD |
| | | | | | ST. PETER - KRESS MBR. |
| | | CANADIAN | KNOX | PRAIRIE DU CHIEN | SHAKOPEE |
| | | | | | NEW RICHMOND |
| | | | | | ONEOTA |
| | | | | | GUNTER |
| | CAMBRIAN | CROIXAN | | | EMINENCE |
| | | | | | POTOSI |
| | | | POTSDAM | | FRANCONIA |
| | | | | | IRONTON-GALESVILLE |
| | | | | | EAU CLAIRE |
| | | | | | MT. SIMON |
| PRECAMBRIAN | | | | | |

GENERALIZED STRATIGRAPHIC COLUMN
OF WINNEBAGO COUNTY

CDM
*environmental engineers, scientists, planners, & management consultants*

Figure No. 3-1




SOURCE: GEOLOGY FOR PLANNING IN BOONE AND WINNEBAGO COUNTIES.
BERG, KEMPTON, STECYK (1984).

SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION STUDY

CDM
*environmental engineers, scientists, planners, & management consultants*

# BEDROCK SURFACE MAP OF WINNEBAGO COUNTY

Figure No. 3-2

### 3.1.2 Geology of the Study Area

The Phase II study was completed primarily to delineate subsurface conditions west of the Phase I study area and to further investigate the Phase I area. The Phase II study area is bordered by South Mulford Road to the east, Sandy Hollow Road to the south, Broadway Street to the north, and the Rock River to the west, an area of approximately 10 square miles. The geology of the study area was determined during the Phase I and II drilling and from other studies (EDI Engineering and Science, 1989; Illinois EPA, 1988; Kay et al., 1994) and subsurface boring logs obtained from Illinois State Water Survey and the City of Rockford. (See Figure 3-3 for soil boring and monitoring well locations, see Appendix A for CDM soil borings logs.)

A variety of sources were used to characterize the geology and hydrogeology of the area. This included information for industrial wells, municipal wells and investigative wells as previously mentioned. Wells that were used for geologic interpretation only are shown on Figure 3-3 but are not listed on Tables 3-2 or 3-3. Only wells that were sampled and/or used for water level measurements during Phase II are shown on Table 3-2. All wells (including Phase I wells) used for interpretive or investigative purposes are shown on Figure 3-3.

As elsewhere in Winnebago County, the geology of the study area generally comprises highly-eroded bedrock overlain by unconsolidated glacial sediments of variable thickness. The study area contains an east-west tributary bedrock valley that merges westward into the Rock Bedrock Valley (see Figure 3-4). Observations from the Phase I and II studies and other drilling projects that were used to characterize the subsurface of the study area are described in the following sections.

The approximate axis of the Rock bedrock valley (see Figure 3-4) was determined by reviewing Berg et al. (1984) and by borings completed in the sandstone at the western portion of the study area. The elevation of the sandstone from the Rockford Products Corporation well RP2-2 is consistent with the approximate elevation of the bottom of the bedrock valley delineated by Berg et al. (1984).

<u>Bedrock</u>

The topography of the bedrock surface of the study area is shown on Figure 3-4. This figure is based on depth-to- bedrock data obtained during Phases I and II and from other drilling efforts in the area. The overall shape of the bedrock surface is that of a narrow, east-west valley in the eastern portion of the study area (from the east boundary near South Mulford Road to 12th Street) that increases in depth to the west until the eastern floor of the Rock Bedrock Valley is encountered.

Three bedrock units of Ordovician age are present at the bedrock surface in the study area: the Galena, Platteville, and Ancell Groups. The Ancell Group consists of the St. Peter Sandstone and the overlying Glenwood Formation (Figure 3-1).

The elevation of the bedrock surface in the study area generally decreases from east to west with some variations due to tributary bedrock valleys. With the decrease in elevation, older bedrock units occur at the bedrock surface. An east-west geologic cross-section which illustrates the stratigraphy of the bedrock groups is displayed as Figure 3-5.

Bedrock within the eastern portion of the study area (east of 20th Street) is predominantly tan to brown dolomite with variable but small amounts of chert and clay-rich horizons. The chert fraction of the drill cuttings was generally less than 10 to 20 percent and usually white or light gray. The clay was frequently brown and usually constituted less than 10 percent of the cuttings; small amounts of pale green shale were also observed. The observed lithology of the drill cuttings is consistent with the general description of the Galena Group given by other workers and with the known aerial extent of this stratigraphic unit in the Rockford area (Willman and Kolata, 1978).

Distinctive clay units known as bentonite beds occur within the Galena and the Platteville Groups and are reported to be very thin (generally less than 2 inches) in northern Illinois (Willman and Kolata, 1978). Bentonite beds were formed from the alteration of volcanic ash deposited during the Ordovician period. Brown, locally laminated clay-rich zones that generally resemble bentonite were identified in the dolomite bedrock at various elevations during the study; however, it was not possible to determine if the zones were bentonite beds due to the lack of sampling capability during bedrock drilling.

The bedrock surface near and west of 24th Street markedly decreases in elevation from east to west, exposing the Platteville Group in some areas. Drill cuttings from MW101 showed gray to tan, finely crystalline, fossiliferous dolomite, which agrees with other observations of the Platteville (Willman and Kolata, 1978).

West of MW113 the Platteville Group is absent and the Ancell Group units are present at the bedrock surface. Borings MW114 and UW7, and Rockford Products Corporation wells, RP1-1, RP2-2, encountered the Ancell Group as the uppermost bedrock unit. At MW112, the Glenwood Formation was encountered as a shale unit at the bedrock surface and was approximately 5 feet thick. At UW7, RP1-1, and RP2-2 the topmost bedrock unit is the St. Peter Sandstone. The observations of the St. Peter Sandstone at MW112 and MW114 are consistent with regional observations of the sandstone, as a tan to white, well-rounded, fine to coarse-grained quartz sandstone. The lithology of the Glenwood Formation appears to vary considerably in the Rockford area. Based on regional well logs, the formation appears to be predominantly dolomitic sandstone and shale with some members of the formation reported to be a green shale. The top of the Glenwood Formation was observed as green shale at MW112; this unit is the Harmony Hill Shale Member of the Glenwood Formation. The Harmony Hill Shale Member was not observed at MW114. This variation in lithology is consistent with observations of the Glenwood from other sources (Berg et al., 1984).

Porous or vuggy zones are common throughout the Galena and Platteville Groups (Willman and Kolata, 1978). Vugs are voids or cavities in rock that are larger than one-quarter inch, commonly formed by erosional processes or dissolution. Indications from CDM's investigation and from other investigations in southeast Rockford are that vugs are present throughout the Galena-Platteville dolomite.

Initial results of a study conducted by the USGS indicate that sub-horizontal fractures are present in the Galena-Platteville dolomite (Kay et al., 1994). These fractures were observed in subsurface borings. Fractures are important in that they influence the hydrogeologic properties of the bedrock. Bedrock fractures will be discussed further in subsection 3.2.

Unconsolidated sediments have filled the bedrock valley and buried the bedrock surface in the study area. The geology of the unconsolidated sediments is described in the following section.

Unconsolidated Sediments

The majority of unconsolidated sediments in the study area are the result of glacial deposition during the Quaternary geologic time period. The surficial representations of the glacial deposits are the Mackinaw Member of the Henry Formation found in the western portion of the study area and the Nimitz Member of the Winnebago Formation located in the eastern part of the study area (Berg et al., 1984). The Mackinaw Member is generally a glacial outwash deposit of sand and gravel, while the Nimitz Member is predominately a till deposit of clay and silt with some sand and gravel. Lesser amounts of unconsolidated river sediments (Cahokia Alluvium) have been fluvially deposited by the Rock River and its tributaries.

Generally, the sediments in the eastern portion of the study area are complexly interbedded till, and outwash deposits of sands, silts, and clays with silts and clays representing approximately 30 per cent of the unconsolidated sediments. Sediments west of 20th Street are predominantly sand with some gravel and discontinuous silt and clay layers. The upper portions of the sediments near the river are consistent with descriptions of the Mackinaw Member of the Henry Formation, which are sand and gravel glacial outwash deposits found near major river valleys. Clay units found in and at the base of the sands and gravels of the Mackinaw member are most likely lacustrine deposits from the Oregon Member of the Glasford Formation (Berg et al., 1984). Lower units are from earlier glacial depositional events.

Gravel and sand deposits found in the area are most likely the result of deposition by glacial meltwaters during events of glacial advancement and retreat (e.g. gravel at 720 to 760 feet elevation above MSL at MW101). The silt and clay found in the till materials in the east portion of the study are the result of direct deposition from the glaciers that moved across the area. Lacustrine deposits are the result of deposition in glacial lakes formed from the blockage of the glacial meltwater drainage system.

Many of the unconsolidated units are laterally discontinuous over short horizontal distances and vary in thickness between well location or grade into other types of unconsolidated materials. The highly variable geology is shown in Figures 3-5 through 3-10.

As an example of the discontinuity of the unconsolidated units, two clay layers (approximately 760 to 745 feet and 730 to 712 feet elevations) at MW105 do not exist a short distance away at either MW104, MW134, or MW106 (Figure 3-6). These clay units probably pinch out to the north and south, although the upper clay unit may grade laterally into the clayey silts at MW104 and MW106. Similarly, the 15-foot thick sand and gravel unit between the two clay units at MW105 thins to less than 5 feet at MW104 and MW106.

Unconsolidated units within the deeper parts of the bedrock valley abut against the sides of the valley. For example, the clayey silt unit at 680 feet MSL in MW105 (Figure 3-5) probably terminates against the bedrock surface to the south and may extend across to the northern flank of the valley. Parallel to the axis of the bedrock valley, the unconsolidated units typically exhibit lateral changes in thickness, grain size, and proportion of fine-grained sediment. The clay units at MW105 do not appear to extend very far to the east or west, whereas some units, such as the clay, sand, and gravel in which MW108, MW112, and MW134 are completed, appear to be traceable for greater distances than other units (Figure 3-5).

The sediments in the western portion of the study area are predominantly sands. However, a clay layer of up to 35-feet thick is found in MW117, MW41, UW7, RP1-3, and MW114 at an elevation of approximately 600 feet that appears to be extensive in the western portion of the study area. A second, intermittent clay layer, approximately 10-feet thick, is found in MW41, MW118, and MW114 at approximately 640 feet above MSL but was not found in MW116 or MW117. These layers are consistent with findings from another subsurface study in Rockford (Wehrmann et al., 1988) that shows lacustrine deposits from the Oregon Member of the Glasford Formation at these elevations in the west portion of the study area.

The complex lateral relationships in the east part of the study area (east of 20th Street) only allow for general stratigraphic correlation.

Particle-size analysis of the unconsolidated sediment provides information about the size distribution and the relative amounts of gravel, sand, and silt and clay in the aquifer. During Phase I, four split-spoon samples of representative aquifer material from the eastern portion of the study area were analyzed for particle-size distribution. In general, particle size was found to vary from less than 0.07 mm to approximately 20 mm (0.003-0.8 inches). Sand was the dominant particle size by weight in most samples, except for the sample from MW110, which had roughly equal amounts of sand and gravel. Silt and clay generally composed 10 percent by weight of the samples, with the exception of the sample from MW104, which contained 35 percent silt and clay.

Eight additional samples (OT126A, OT126B, OT130G, OT114A, OT114B, OT133, OT101A, OT122) were collected during Phase II for geotechnical analysis. The samples were analyzed for grain size; additionally, samples OT101A, OT133, and OT122 (samples primarily of clay with silt or sand) were analyzed for hydraulic conductivity using ASTM Method D5084-90, Hydraulic Conductivity Using a Flexible Wall Permeameter. Results of the conductivity tests show low conductivities, [OT101A ($4.6 \times 10^{-9}$ ft/sec), OT133 ($5.6 \times 10^{-7}$ ft/sec), and OT122 ($1.3 \times 10^{-9}$ ft/sec)]. Hydraulic conductivities of $10^{-9}$ ft/sec greatly inhibit migration of groundwater and contaminants. Results of the particle-size analyses and the hydraulic conductivity tests are presented on Table 3-1. Laboratory results are given in Appendix B.

# 3.2 Hydrogeology

## 3.2.1 Aquifers

Groundwater aquifers in the following three units are the focus of the investigation: the unconsolidated glacial sediments, the Galena-Platteville dolomite, and the St. Peter Sandstone. These aquifers will be referred to as the unconsolidated aquifer, the dolomite aquifer, and the sandstone aquifer, respectively. Details of wells installed in the aquifiers that were used for data points during this study are shown on Table 3-2.

Unconsolidated glacial sediments are found throughout the study area; they generally overlie the dolomite aquifer in the eastern half of the study area and overlie the sandstone aquifer in the western half (see Figure 3-5). Bedrock topography reflects the presence of the pre-glacial Rock Bedrock Valley located in the western portion of the study area, and an east-west tributary valley located in the eastern portion of the study area. The deepest parts of the Rock Bedrock Valley contain the St. Peter Sandstone leaving the younger dolomite bedrock as the valley flanks. (Figure 3-4 delineates the extent of the sandstone [Ancell] and the dolomite [Galena-Platteville] at the study area.)

No areally continuous aquitards were encountered in the unconsolidated materials, indicating that the unconsolidated aquifer is hydraulically connected to the dolomite aquifer in the east half of the study area and the sandstone aquifer in the west. This is evidenced by static water levels in well nests where wells were screened in both the dolomite bedrock and the unconsolidated aquifers. Comparison of levels in MW101A to MW101C, MW103A to MW103B, MW107A to MW107C, and MW109A to MW109B all show static water levels within one-half foot (see Table 3-3). This small head would suggest that the aquifers are in hydraulic communication at these locations.

Additionally, well nest MW114 showed less than one foot of head difference between MW114A, screened in the unconsolidated aquifer and MW114B, which was screened in the sandstone. This suggests that the unconsolidated and sandstone aquifers are hydraulically connected at this location.

Several locations that have wells screened above and below clay layers show substantial differences in static water elevations. For example, both MW09 and MW29 are screened above a clay layer found at 665 to 658 feet above MSL in the western half of the study area. The head difference is typically one foot or less for these wells (Table 3-3). The head in MW118, located adjacent to MW09 and MW29 and screened below the clay layer, is approximately three to five feet lower than MW09 and MW29. Although periodic use of nearby municipal well UW35 may influence heads at this location, available data indicate that clay layers may create a semi-confined condition.

Within the unconsolidated aquifer, clay layers of significant thickness (up to 39 feet) were found in parts of the buried bedrock valley (e.g. at MW115, MW102 and MW105). Unsaturated clay horizons were observed in numerous borings in Area 7 (see Figures 3-8 and 3-9). These clay horizons are locally important in that they divert groundwater movement.

The clay layers in the eastern part of the study area appear to be localized and do not extend across the entire study area. Locally, clay layers and clay-rich zones probably cause the substantial (14-foot) head difference between the shallow (MW102A) and the intermediate (MW102B) depth well observed in October 1993 in the MW102 nest (see Table 3-3 for head differences).

The sandstone and the dolomite aquifers do not appear to be hydraulically connected in the area east of 20th Street. A comparison of water levels in well MW112C to MW112B typically show an approximate 100-foot head difference, most likely due to pumpage of the nearby municipal well UW16, located northeast of the MW112 cluster. This head difference shows that the dolomite and the sandstone are probably not hydraulically connected at this location, most likely due to the Harmony Hill Member of the Glenwood Formation which is an aquitard that separates the dolomite and the sandstone.

Porous or vuggy zones are common throughout the Galena Group (Willman and Kolata, 1978). Although it was not possible to determine the presence of distinct vuggy zones from drill cuttings, it is possible that vugs or vuggy horizons were responsible for the loss of drilling fluids and grout in wells MW104, MW108, MW109, and MW113 because of the greater porosity and permeability expected in these zones. Fractured zones, which could also be responsible for the loss of drilling fluids, could not be observed during drilling.

Results from a study (Kay et al., 1994) in the east portion of the study area suggest that vuggy zones were observed in the dolomite and subhorizontal fractures, most likely bedding planes, were observed in the lower portions of the dolomite. The study also indicated that, based on comparison of accustic-televiewer and flow meter data, a concentration of flow in the dolomite aquifer is through subhorizontal fractures found in the lower parts of the dolomite. Additionally, a concentration of flow was observed in the upper few feet of the dolomite.

At MW108, loss of grout occurred in the gravelly zone above bedrock. At MW103 and MW109, loss of either drilling mud or grout occurred in the top 10 to 20 feet of bedrock. At MW103 and MW104, grout loss occurred approximately 50-55 feet below the bedrock surface during well installation. In addition, at location MW104, a localized solution zone containing fine-grained sediment was encountered during air-rotary drilling in bedrock. In the depth interval 80 to 100 feet, drill cuttings were predominantly brown, silty/clayey sediment (typically 70-90% by visual estimation) occupying solution cavities in bedrock; bedrock at MW104 is approximately 77 feet deep. Rapid advancement of the drill bit from 80 to 100 feet was also observed during the drilling of the borehole. This solution zone was not encountered in a borehole located twelve feet away, suggesting a localized extent of the solution feature.

Intergranular flow through an interconnected pore network is the pathway for groundwater flow in the unconsolidated and sandstone aquifers. Groundwater flow in the dolomite is under double porosity conditions: through intergranular flow, and through planar structures including low-angle bedding planes (as previously indicated) and through diffuse conduits (interconnected vugs, solution cavities, etc.). Vertical and inclined fractures have been observed in the dolomite nearby quarries (Kay et al., 1994) but have not been observed in the study area.

Wells MW103D and MW101D were both screened in the lower confines of the dolomite aquifer where subhorizontal fractures were identified during drilling and logging conducted by the USGS. Flow measurements indicated that the concentration of flow in the dolomite aquifer is through the subhorizontal bedding planes and the upper few feet of the aquifer; however, there is no evidence showing vertical interconnection of different bedding planes by high-angle fractures. Conductivities measured by CDM in these wells were the highest ($2.4 \times 10^{-4}$ ft/sec) and second highest ($1.7 \times 10^{-4}$ ft/sec), respectively, in the dolomite aquifer. This suggests that the bedding planes can be a significant flow pathway in the dolomite aquifer. The USGS report also indicated that vertical head differences increased with depth in the dolomite aquifer. Lastly, the report indicated that the effects of pumpage of the sandstone aquifer do not extend upward into the lower part of the dolomite aquifer as determined by a boring (BH3) approximately 2,750 feet from the pumped well.

### 3.2.2 Groundwater Flow

The direction of groundwater flow was determined from monitoring well water level measurements collected during the remedial investigation. Groundwater elevations for October 1993 and February 1994 are summarized on Table 3-3. Groundwater contours for the unconsolidated aquifer and the dolomite aquifer are shown in Figures 3-11 and 3-12, respectively. Groundwater elevations for the sandstone aquifer were not contoured because only two data points are available.

Based on CDM's study, the general direction of groundwater flow in the study area is to the west in both the unconsolidated and the dolomite aquifers. A previous study showed that the groundwater flow direction in the sandstone aquifer is complex due to several cones of depression from pumpage of the aquifer by the City and various industries such as Ingersoll Milling Machine Company, Essex International, Inc., and others (Visocky, 1993). In the unconsolidated aquifer, the flow in the eastern portion of the study area (20th Street to Alpine Road) is west with a slight northerly direction. When compared to the groundwater contours in the western portion of the study area (based on contours from wells MW111A to MW142), contours in the east are more closely spaced denoting a larger hydraulic gradient (0.012), most likely due to the influence of the low conductivity till materials found in the subsurface bedrock valley (see Section 3.1). From MW15 to MW128, the flow direction continues in the same direction; however, the gradient decreases significantly (0.0047) once groundwater encounters the higher conductivity materials (predominantly sands) found in the western portion of the study area. Past Eighth Street and to the river (in a line from MW128 to MW117) the gradient decreases again (0.001) and the flow direction turns to the southwest, probably due to the influence of the Rock River. An average gradient of .003 was calculated for the western portion of the study area; an average gradient of .006 was calculated for the entire unconsolidated aquifer.

Of the two wells installed in the sandstone aquifer (MW112C and MW114B) MW112C, in the east portion of the study area, MW112C showed a lower water elevation (689.13 feet MSL) than MW114B (697.46 feet). Although these elevations indicate the possibility of an easterly flow direction, the actual flow directions in the sandstone aquifer are multi-directional due to pumpage from municipal wells screened in the sandstone.

Vertical hydraulic gradients are present between the unconsolidated and bedrock aquifers, and within the dolomite aquifer (see Table 3-4). Vertical hydraulic gradients indicate the tendency of groundwater to flow vertically. Downward gradients exist at 10 of the 23 monitoring well nest locations where the vertical gradient was determined, with the largest occurring at MW134. The largest upward hydraulic gradient occurs at MW133. Geographically, the wells with an upward gradient are generally in the center of the study area, in an area bordered by Twentieth Street, Alpine Road, Harrison Avenue, and Sandy Hollow Road. An exception is well clusters MW1 and MW117, located in the western area of the study area, that also have upward gradients. Figure 3-13 illustrates the spatial distribution of vertical hydraulic gradients for the unconsolidated and dolomite aquifers.

Most of the wells with upward hydraulic gradients in the eastern part of the study area are located on the southern and eastern parts the bedrock valley. There is some lateral flow from the dolomite into the unconsolidated deposits in this area. The upgradient part of the buried bedrock valley may be serving as a discharge area for flow from the upper part of the dolomite aquifer.

### *3.2.3 Hydraulic Conductivity*

Hydraulic conductivity is the capacity of rock or sediment units to transmit water. It is expressed as the volume of water that will move in unit time under a hydraulic gradient through a unit area measured at right angles to the direction of flow.

Hydraulic conductivity measurements were obtained using the slug test method as described in subsection 2.8. The Bouwer and Rice (1976) method was used to analyze the slug test data. Hydraulic conductivity (K) results are summarized on Table 3-5, complete results are given in Appendix C.

Hydraulic conductivities for the unconsolidated aquifer were determined for both the east and the west portion of the study area by testing 37 wells, 23 wells in the east section and 14 in the west. Conductivities for the dolomite aquifer were determined by testing 22 wells; 2 wells were tested in the sandstone aquifer. The range of conductivity values for the unconsolidated aquifer, both east and west portions, is $3.9 \times 10^{-7}$ ft/sec in MW122B to $9.6 \times 10^{-4}$ ft/sec in MW121 with a geometric mean of $3.9 \times 10^{-5}$ ft/sec. For the east portion of the study area, the conductivity ranged from $3.9 \times 10^{-7}$ ft/sec in MW122B to $7.8 \times 10^{-4}$ ft/sec in MW102B with a geometric mean in the east unconsolidated materials of $4.0 \times 10^{-5}$ ft/sec. The west portion of the study area showed conductivities of $1.6 \times 10^{-6}$ ft/sec in MW114A to $9.6 \times 10^{-4}$ ft/sec in MW121. The geometric mean of the west portion is $3.9 \times 10^{-5}$ ft/sec.

## TABLE 3-5
## AQUIFER HYDRAULIC CONDUCTIVITIES
## SOUTHEAST ROCKFORD GROUNDWATER STUDY

Mean of Aquifer Conductivities

| | ft/sec | data pts. |
|---|---|---|
| Mean of Unconsolidated Aquifer | 3.93E-05 | 37 |
| Mean of East Unconsolidated Aquifer | 3.96E-05 | 23 |
| Mean of West Unconsolidated Aquifer | 3.89E-05 | 14 |
| Mean of Dolomite Aquifer | 2.96E-05 | 22 |
| Mean of Sandstone Aquifer | 1.05E-04 | 2 |
| Total | | 61 |

Range of Hydraulic Conductivities

| | ft/sec |
|---|---|
| Maximum of Unconsolidated Aquifer | 9.58E-04 |
| Minimum of Unconsolidated Aquifer | 3.88E-07 |
| Maximum of Unconsolidated Aquifer East | 7.84E-04 |
| Minimum of Unconsolidated Aquifer East | 3.88E-07 |
| Maximum of Unconsolidated Aquifer West | 9.58E-04 |
| Maximum of Unconsolidated Aquifer West | 1.60E-06 |
| Maximum of Dolomite Aquifer | 2.37E-04 |
| Minimum of Dolomite Aquifer | 2.86E-06 |

The mean conductivities of the east portion of the unconsolidated aquifer are similar to the western portion of study area. This is most likely due to the preferential placement of the wells into materials of higher permeability in the eastern portion of the study area.

Based on testing 22 wells, the range of hydraulic conductivities for the dolomite bedrock aquifer was $2.9 \times 10^{-6}$ ft/sec in MW109B to $2.4 \times 10^{-4}$ ft/sec in MW103D, with a geometric mean of $3.0 \times 10^{-5}$ ft/sec. The mean K for the dolomite bedrock falls at the top of the range of values for limestone and dolomite (Freeze and Cherry, 1979).

Two wells (MW114B and MW112C) that were installed in the sandstone aquifer were tested for conductivity. The geometric mean for these two wells was $1.1 \times 10^{-4}$ ft/sec.

# TABLE 3-2
## GROUNDWATER MONITORING WELL DATA
## SOUTHEAST ROCKFORD GROUNDWATER STUDY

| Well Number | Depth to Screen Base* | Top of Screen Elevation | Bottom of Screen Elevation | Screen Length | Aquifer Screened | Top of Casing Elevation | Ground Surface Elevation |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| IW19 | 75.0 | 660 0 | 650 0 | 10 | unconsolidated | NS | 725.0 |
| IW20 (MWS34A) | 105 0 | 730.0 | 720.0 | 10 | unconsolidated | NS | 825.0 |
| IW21 (MWS34) | 155.0 | 680 0 | 670.0 | 10 | bedrock | NS | 825.0 |
| IW22 (MWS41) | 70.0 | 750.0 | 740 0 | 10 | unconsolidated | NS | 810.0 |
| IW23 (MWS5) | 65.0 | 788 0 | 778 0 | 10 | bedrock | NS | 843.0 |
| IW24 (MWS9) | 53.0 | 789.0 | 779 0 | 10 | bedrock | NS | 832.0 |
| IW25 (MWS31) | 62.0 | 781.0 | 771.0 | 10 | bedrock | NS | 833.0 |
| MW01 | 87 5 | 650.8 | 645.8 | 5 | unconsolidated | 734.06 | 733.3 |
| MW02 | 50 5 | 687 8 | 682.8 | 5 | unconsolidated | 735.3 | 733.3 |
| MW05 | 122.7 | 615 6 | 610 6 | 5 | unconsolidated | 735.58 | 733 3 |
| MW09 | 47 9 | 673 2 | 668 2 | 5 | unconsolidated | 718 13 | 716.1 |
| MW12 | 55 5 | 678 4 | 673 4 | 5 | unconsolidated | 730 97 | 728.9 |
| MW15 | 49 5 | 699.7 | 694 7 | 5 | unconsolidated | 746.17 | 744 2 |
| MW16 | 47 7 | 685 3 | 680 3 | 5 | unconsolidated | 728.04 | 728.0 |
| MW17 | 43 3 | 686.5 | 681 5 | 5 | unconsolidated | 726.8 | 724.8 |
| MW19 | 47 5 | 689 8 | 684 8 | 5 | unconsolidated | 734 33 | 732.3 |
| MW20 | 51 6 | 675 8 | 670 8 | 5 | unconsolidated | 724 35 | 722.4 |
| MW21 | 44 6 | 684 5 | 679 5 | 5 | unconsolidated | 726.14 | 724.1 |
| MW22 | 43 5 | 689 7 | 684 7 | 5 | unconsolidated | 730 19 | 728.2 |
| MW24 | 40 9 | 693 9 | 688 9 | 5 | unconsolidated | 731 75 | 729.8 |
| MW26 | 70.3 | 692 7 | 687 7 | 5 | unconsolidated | 759.95 | 758.0 |
| MW27 | 59.9 | 696 2 | 691 2 | 5 | unconsolidated | 753.06 | 751.1 |
| MW29 | 34 9 | 686 4 | 681 3 | 5 | unconsolidated | 718 16 | 716.2 |
| MW30 | 48 3 | 683 0 | 678 0 | 5 | unconsolidated | 728 29 | 726.3 |
| MW31 | 60 4 | 670 4 | 665 4 | 5 | unconsolidated | 727 85 | 725 8 |
| MW32 | 48.0 | 689 3 | 684 3 | 5 | unconsolidated | 734 3 | 732.3 |
| MW33 | 44 0 | 694 8 | 689 8 | 5 | unconsolidated | 735 81 | 733.8 |
| MW34 | 42.6 | 694 3 | 689 3 | 5 | unconsolidated | 733 88 | 731 9 |
| MW35 | 42 8 | 688 6 | 683 6 | 5 | unconsolidated | 728 41 | 726.4 |
| MW36 | 47 9 | 687 7 | 682 7 | 5 | unconsolidated | 732 56 | 730.6 |
| MW37 | 44 3 | 686 1 | 681 1 | 5 | unconsolidated | 725 35 | 725.4 |
| MW38 | 47 0 | 685 2 | 680 2 | 5 | unconsolidated | 729 15 | 727.2 |
| MW39 | 51 4 | 685 1 | 680 1 | 5 | unconsolidated | 731 08 | 731 5 |
| MW41 | 83 4 | 647 2 | 637 2 | 10 | unconsolidated | 722.59 | 720.6 |
| MW42 | 51.8 | 680 3 | 675 3 | 5 | unconsolidated | 729.14 | 727.1 |
| MW43 | 79 4 | 657 4 | 652 4 | 5 | unconsolidated | 733 8 | 731.8 |
| MW45 | 70 4 | 680 6 | 670 6 | 10 | unconsolidated | 743 01 | 741 0 |
| MW46 | 73 1 | 654 5 | 649 5 | 5 | unconsolidated | 724 65 | 722.6 |
| MW47 | 53.0 | 685 7 | 680 7 | 5 | unconsolidated | 735 66 | 733.7 |

All measurements in feet, elevations are in feet above mean sea level.
* Depth to base of screen is distance from ground surface to base of screen.
Table displays only wells sampled and/or measured for water levels during Phase I II.

# TABLE 3-2
# GROUNDWATER MONITORING WELL DATA
# SOUTHEAST ROCKFORD GROUNDWATER STUDY

| Well Number | Depth to Screen Base* | Top of Screen Elevation | Bottom of Screen Elevation | Screen Length | Aquifer Screened | Top of Casing Elevation | Ground Surface Elevation |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| MW101A | 88 0 | 686 1 | 676.1 | 10 | unconsolidated | 765 62 | 764.1 |
| MW101B | 150 1 | 624 0 | 614 0 | 10 | bedrock | 766 62 | 764.1 |
| MW101C | 172 | 602 0 | 592.0 | 10 | bedrock | 766.48 | 764 0 |
| MW101D | 212.8 | 561.1 | 551.1 | 10 | bedrock | 764 96 | 763 9 |
| MW102A | 35 | 761 5 | 751 5 | 10 | unconsolidated | 788 43 | 786.5 |
| MW102B | 98 | 698 6 | 688.6 | 10 | unconsolidated | 788.61 | 786.6 |
| MW102C | 184 3 | 613.4 | 603 4 | 10 | bedrock | 789.87 | 787.7 |
| MW103A | 41 | 759 5 | 749.5 | 10 | unconsolidated | 792.56 | 790.5 |
| MW103B | 75 | 725.4 | 715 4 | 10 | bedrock | 792.39 | 790.4 |
| MW103C | 107 9 | 692.3 | 682 3 | 10 | bedrock | 792.35 | 790.2 |
| MW103D | 200.5 | 599 7 | 589.7 | 10 | bedrock | 790 39 | 790.2 |
| MW104A | 77 | 748 9 | 738 9 | 10 | unconsolidated | 818 10 | 815.9 |
| MW104B | 121.9 | 703 3 | 693.3 | 10 | bedrock | 817 37 | 815.2 |
| MW104C | 146 | 680.1 | 670 1 | 10 | bedrock | 818 25 | 816.1 |
| MW105A | 22 | 771 3 | 761 3 | 10 | unconsolidated | 785 57 | 783.3 |
| MW105B | 54 | 739 6 | 729.6 | 10 | unconsolidated | 785.78 | 783.6 |
| MW105C | 95 | 698.5 | 688 5 | 10 | unconsolidated | 785.66 | 783.5 |
| MW105D | 156.8 | 637 3 | 627.3 | 10 | bedrock | 786.21 | 784.1 |
| MW106A | 40 | 773 5 | 763.5 | 10 | unconsolidated | 805.80 | 803.5 |
| MW106B | 86.4 | 727 0 | 717 0 | 10 | bedrock | 805 59 | 803.4 |
| MW106C | 119 4 | 694 0 | 684 0 | 10 | bedrock | 805 46 | 803.4 |
| MW107A | 38 | 781 3 | 771 3 | 10 | unconsolidated | 808.86 | 809.3 |
| MW107B | 66 | 753 3 | 743 3 | 10 | unconsolidated | 808 87 | 809 3 |
| MW107C | 140 4 | 678 8 | 668.8 | 10 | bedrock | 808 70 | 809.2 |
| MW108A | 39 | 794 0 | 784 0 | 10 | unconsolidated | 824 90 | 823 0 |
| MW108B | 61 | 771 9 | 761 9 | 10 | unconsolidated | 824.93 | 822.9 |
| MW108C | 134 3 | 698 8 | 688 8 | 10 | bedrock | 825 16 | 823 1 |
| MW109A | 32 | 826 7 | 816 7 | 10 | unconsolidated | 850 89 | 848 7 |
| MW109B | 60 | 798 5 | 788.5 | 10 | bedrock | 850 47 | 848 5 |
| MW109C | 85 | 773 4 | 763 4 | 10 | bedrock | 850 47 | 848.4 |
| MW109D | 39 | 819 0 | 809.0 | 10 | bedrock | 850 65 | 848 0 |
| MW110A | 40 | 814 2 | 804 2 | 10 | unconsolidated | 846 65 | 844 2 |
| MW110B | 71 3 | 782.8 | 772.8 | 10 | unconsolidated | 846 18 | 844.1 |
| MW110C | 111 4 | 742 8 | 732.8 | 10 | bedrock | 846 24 | 844 2 |
| MW111A | 35 | 805.7 | 795.7 | 10 | unconsolidated | 832 84 | 830.7 |
| MW111B | 58 | 782 7 | 772.7 | 10 | unconsolidated | 832 44 | 830.7 |
| MW111C | 97.3 | 743 4 | 733.4 | 10 | bedrock | 833 26 | 830.7 |
| MW112A | 35 | 774 9 | 764.9 | 10 | unconsolidated | 802 58 | 799.9 |
| MW112B | 95 | 715.3 | 705.3 | 10 | bedrock | 803.05 | 800.3 |
| MW112C | 300 | 510 2 | 500.2 | 10 | sandstone | 802.83 | 800.2 |
| MW113A | 105 | 677 0 | 662.0 | 15 | bedrock | 766 54 | 767.0 |
| MW113B | 155 | 621 4 | 611.4 | 10 | bedrock | 766.65 | 766.4 |
| MW114A | 95 | 639 9 | 629.9 | 10 | unconsolidated | 729.89 | 724.9 |
| MW114B | 220 | 515 2 | 505.2 | 10 | sandstone | 727.42 | 725.2 |
| MW115A | 100 | 711 9 | 701 9 | 10 | unconsolidated | 801.33 | 801.9 |
| MW115B | 130.5 | 682.4 | 672.4 | 10 | unconsolidated | 802.26 | 802.9 |
| MW116A | 79.5 | 664 2 | 654.2 | 10 | unconsolidated | 736 24 | 733.7 |

All measurements in feet, elevations are in feet above mean sea level.
* Depth to base of screen is distance from ground surface to base of screen.
Table displays only wells sampled and/or measured for water levels during Phase I II.

# TABLE 3-2
# GROUNDWATER MONITORING WELL DATA
# SOUTHEAST ROCKFORD GROUNDWATER STUDY

| Well Number | Depth to Screen Base* | Top of Screen Elevation | Bottom of Screen Elevation | Screen Length | Aquifer Screened | Top of Casing Elevation | Ground Surface Elevation |
|---|---|---|---|---|---|---|---|
| MW116B | 164.5 | 579.3 | 569.3 | 10 | unconsolidated | 736.35 | 733.8 |
| MW117A | 39.5 | 666.9 | 656.9 | 10 | unconsolidated | 696.19 | 696.4 |
| MW117B | 89.5 | 616.9 | 606.9 | 10 | unconsolidated | 696.26 | 696.4 |
| MW117C | 159.5 | 546.9 | 536.9 | 10 | unconsolidated | 696.11 | 696.4 |
| MW118 | 96.5 | 631.4 | 621.4 | 10 | unconsolidated | 717.59 | 717.9 |
| MW119 | 59.5 | 667.0 | 657.0 | 10 | unconsolidated | 718.97 | 716.5 |
| MW121 | 64.5 | 660.0 | 650.0 | 10 | unconsolidated | 716.98 | 714.5 |
| MW122A | 60 | 760.5 | 750.5 | 10 | unconsolidated | 810.47 | 810.5 |
| MW122B | 130 | 690.6 | 680.6 | 10 | unconsolidated | 810.33 | 810.6 |
| MW123 | 45 | 689.9 | 684.9 | 5 | unconsolidated | 729.52 | 729.9 |
| MW124 | 100 | 634.0 | 629.0 | 5 | unconsolidated | 731.30 | 729.0 |
| MW125 | 45.5 | 692.4 | 682.4 | 10 | unconsolidated | 727.31 | 727.9 |
| MW126A | 54.5 | 683.4 | 673.4 | 10 | unconsolidated | 727.62 | 727.9 |
| MW126B | 84.5 | 648.4 | 643.4 | 5 | unconsolidated | 727.60 | 727.9 |
| MW127 | 41.5 | 694.7 | 684.7 | 10 | unconsolidated | 728.59 | 726.2 |
| MW128 | 43 | 690.8 | 685.8 | 5 | unconsolidated | 728.40 | 728.8 |
| MW129 | 32 | 705.1 | 700.1 | 5 | unconsolidated | 732.12 | 732.1 |
| MW130 | 37.5 | 700.5 | 690.5 | 10 | unconsolidated | 727.95 | 726.0 |
| MW131 | 32.5 | 706.9 | 701.9 | 5 | unconsolidated | 736.95 | 734.4 |
| MW132 | 33 | 700.7 | 695.7 | 5 | unconsolidated | 728.73 | 728.7 |
| MW133A | 35 | 752.6 | 742.6 | 10 | unconsolidated | 780.18 | 777.6 |
| MW133B | 58 | 729.5 | 719.5 | 10 | unconsolidated | 780.33 | 777.5 |
| MW133C | 96 | 691.7 | 681.7 | 10 | bedrock | 780.29 | 777.7 |
| MW134A | 27 | 777.1 | 772.1 | 5 | unconsolidated | 799.09 | 799.1 |
| MW134B | 45 | 758.9 | 753.9 | 5 | unconsolidated | 798.80 | 798.9 |
| MW134C | 63 | 741.2 | 736.2 | 5 | unconsolidated | 799.11 | 799.2 |
| MW135 | 34 | 803.8 | 798.8 | 5 | unconsolidated | 835.19 | 832.8 |
| MW136 | 45 | 794.9 | 789.9 | 5 | bedrock | 834.77 | 834.9 |
| MW138 | 38 | 699.3 | 694.3 | 5 | unconsolidated | 734.79 | 732.3 |
| MW140 | 36.5 | 706.4 | 701.4 | 5 | unconsolidated | 739.71 | 737.9 |
| MW141 | 52 | 711.4 | 706.4 | 5 | unconsolidated | 758.06 | 758.4 |
| MW142 | 53 | 711.1 | 706.1 | 5 | unconsolidated | 758.73 | 759.1 |
| IW1 | 52.2 | 687.2 | 682.0 | 5 | unconsolidated | 736.42 | 734.2 |
| IW3 | 52.2 | 688.0 | 683.0 | 5 | unconsolidated | 737.64 | 735.2 |
| IW4 | 52.3 | 688.0 | 683.0 | 5 | unconsolidated | 737.71 | 735.3 |
| IW5 | 52.0 | 688.5 | 683.5 | 5 | unconsolidated | 737.81 | 735.5 |
| IW7 | 42.0 | 693.0 | 688.0 | 5 | unconsolidated | NS | 730.0 |
| IW8 | 42.0 | 693.0 | 688.0 | 5 | unconsolidated | NS | 730.0 |
| IW9 | 42.0 | 703.0 | 698.0 | 5 | unconsolidated | NS | 740.0 |
| IW10 | 37.0 | 703.0 | 698.0 | 5 | unconsolidated | NS | 735.0 |
| IW11 | 35.0 | 705.0 | 700.0 | 5 | unconsolidated | NS | 735.0 |
| IW12 (G101S) | 56.5 | 681.0 | 676.0 | 5 | unconsolidated | 734.74 | 732.5 |
| IW13 (G101D) | 94.6 | 643.0 | 638.0 | 5 | bedrock | 734.60 | 732.6 |
| IW14 | 45.0 | 792.0 | 787.0 | 5 | unconsolidated | NS | 832.0 |
| IW15 (MWS33) | 120.0 | 700.0 | 690.0 | 10 | bedrock | NS | 810.0 |
| IW16 | 36.0 | 694.0 | 684.0 | 10 | unconsolidated | NS | 720.0 |
| IW17 | 33.0 | 697.0 | 687.0 | 10 | unconsolidated | NS | 720.0 |

All measurements in feet, elevations are in feet above mean sea level.

* Depth to base of screen is distance from ground surface to base of screen.

Table displays only wells sampled and/or measured for water levels during Phase I II.

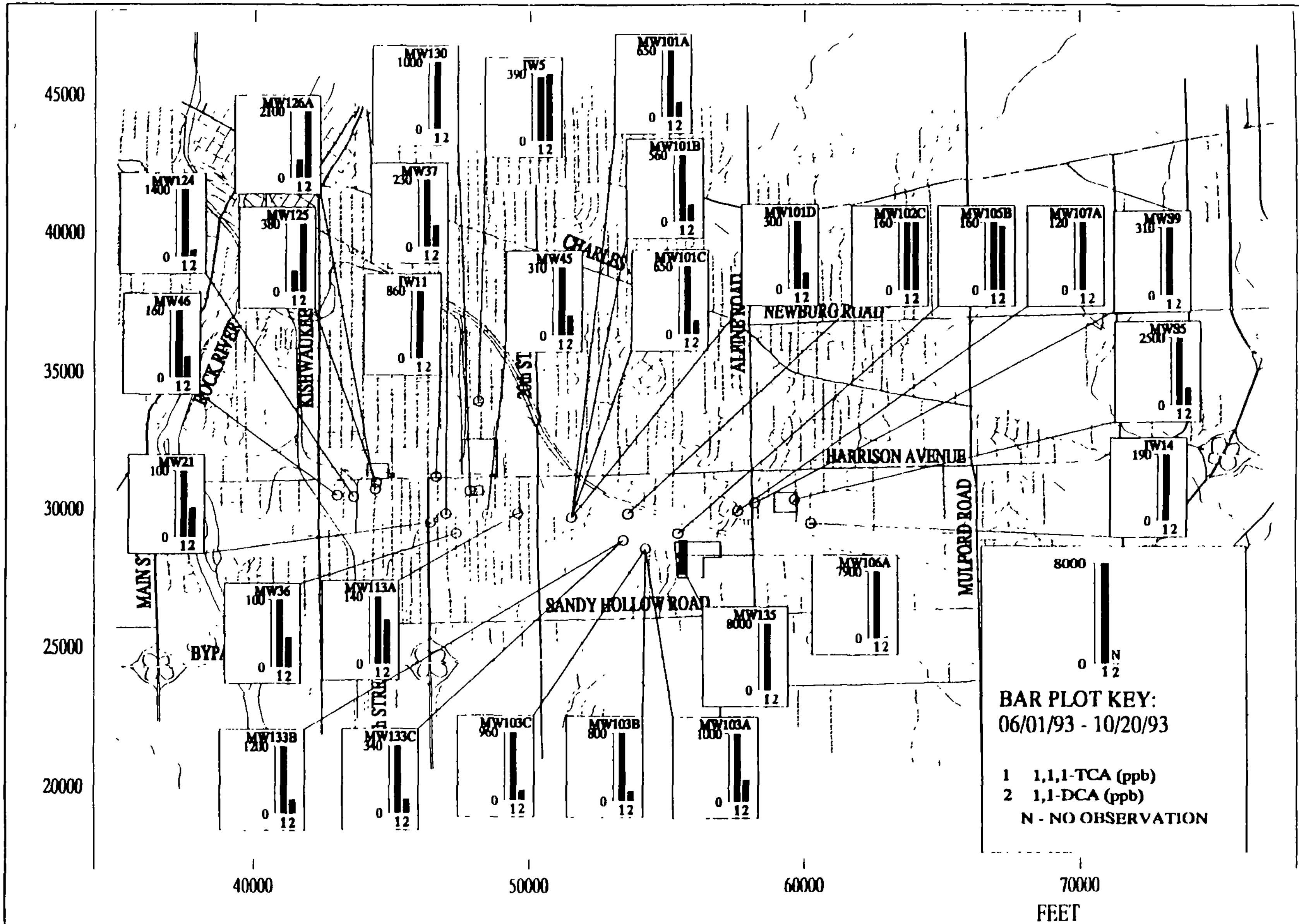
Area 9: Area 9 was considered as a potential source area based on the same evidence as the adjacent Area 3. In both cases soil gas sampling was initiated in order to evaluate the source of PCE and other contaminants in wells located roughly downgradient (MW46 and a Rockford Products facility well, each located about 1,200 feet west-southwest of Area 3). However, Area 9 was located outside the Phase I study area; it was considered a potential source before commencement of Phase II work, when the study area was expanded. Soil gas work in Area 9 in Phase II shows the existence of moderate concentrations of TCA, PCE, and TCE (91 to 120 µg/L) at the easternmost location sampled. Locations farther to the east were not accessible. One subsurface boring was drilled and sampled at the soil gas sample location noted above, but very low contaminant concentrations (5 ppb of PCE) were detected. This one data point is not sufficient to evaluate any contributions to groundwater contamination from potential sources within the area.

Groundwater samples from wells roughly downgradient from Area 9 (MW123, MW124, MW125, and MW126A and B) show concentrations of TCA, TCE, PCE, and other compounds at levels significantly higher than in wells just upgradient (MW20 and MW127). This evidence also supports the idea of a contaminant source area in Area 9. However, the lack of access and the presence of structures (a factory and several railroad tracks) in the eastern portion of Area 9 precluded additional soil gas work or subsurface soil sampling in that suspect portion of Area 9. As a result, there is only circumstantial evidence from soil gas and groundwater sampling that suggests a contaminant source may exist in Area 9.

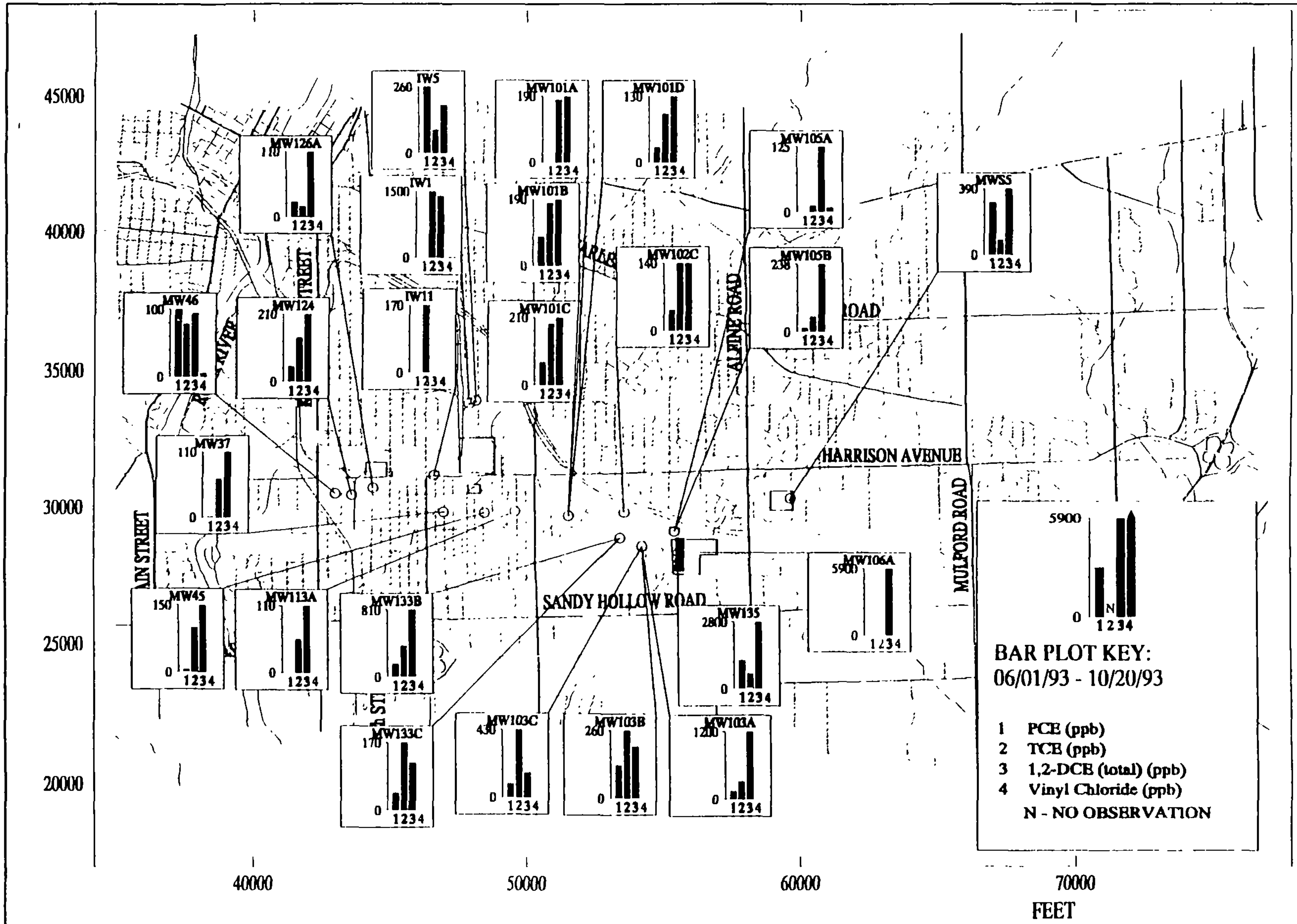
Area 10: Area 10 was considered a potential source area because of elevated contaminant concentrations that have appeared in past groundwater samples (prior to Phase II) of downgradient well MW20; however, the Phase II sample from MW20 showed considerably lower concentrations of chlorinated VOCs than in previous samples. Nevertheless, other wells located roughly downgradient (MW124, MW125, MW126A and B) from Area 10 showed elevated contaminant concentrations in Phase II samples, as noted in the discussion under Area 9. Soil gas samples in Area 10 showed only two samples with a target compound detected at greater than 1 µg/L (TCA at 3 and 2 µg/L, respectively). Based on these low detected concentrations and on the fact that the two samples are not adjacent to each other, it appears that the surveyed portions of Area 10 do not constitute contaminant sources to groundwater.

However, not all portions of Area 10 were accessible for soil gas sampling in Phase II. One portion of Area 10 that remains a potential source area is the southwestern corner of Area 10, located adjacent to the eastern portion of Area 9. This portion of Area 10 is still suspect because it is located upgradient of contaminated wells MW124, MW125, and MW126A and B, while also being located side-gradient of the relatively uncontaminated well MW20. The adjacent eastern portion of Area 9 is somewhat more likely as a potential source area than Area 10, owing to the detections of moderate concentrations of target compounds (91 to 120 µg/L) in one Area 9 soil gas sample. As no comparable soil gas concentrations were reported from Area 10, this area is suspect simply because of its location.

Area 11: Similar to Area 10, this area was considered a potential source area based on the presence of elevated contaminant concentrations in groundwater samples prior to 1993 from well MW20 locally approximately downgradient, and in Phase II samples from wells MW124,




| | | |
|---|---|---|
| FIGURE 5-25 | SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY<br>1993 MEASURED TCA AND 1,1-DCA CONCENTRATIONS | CDM<br>environmental engineers, scientists, planners, & management consultants |




| FIGURE 5-24 | SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY<br><br>1993 MEASURED PCE, TCE, 1,2-DCE, AND VINYL CHLORIDE CONCENTRATIONS | CDM<br>environmental engineers, scientists, planners, & management consultants |
|---|---|---|

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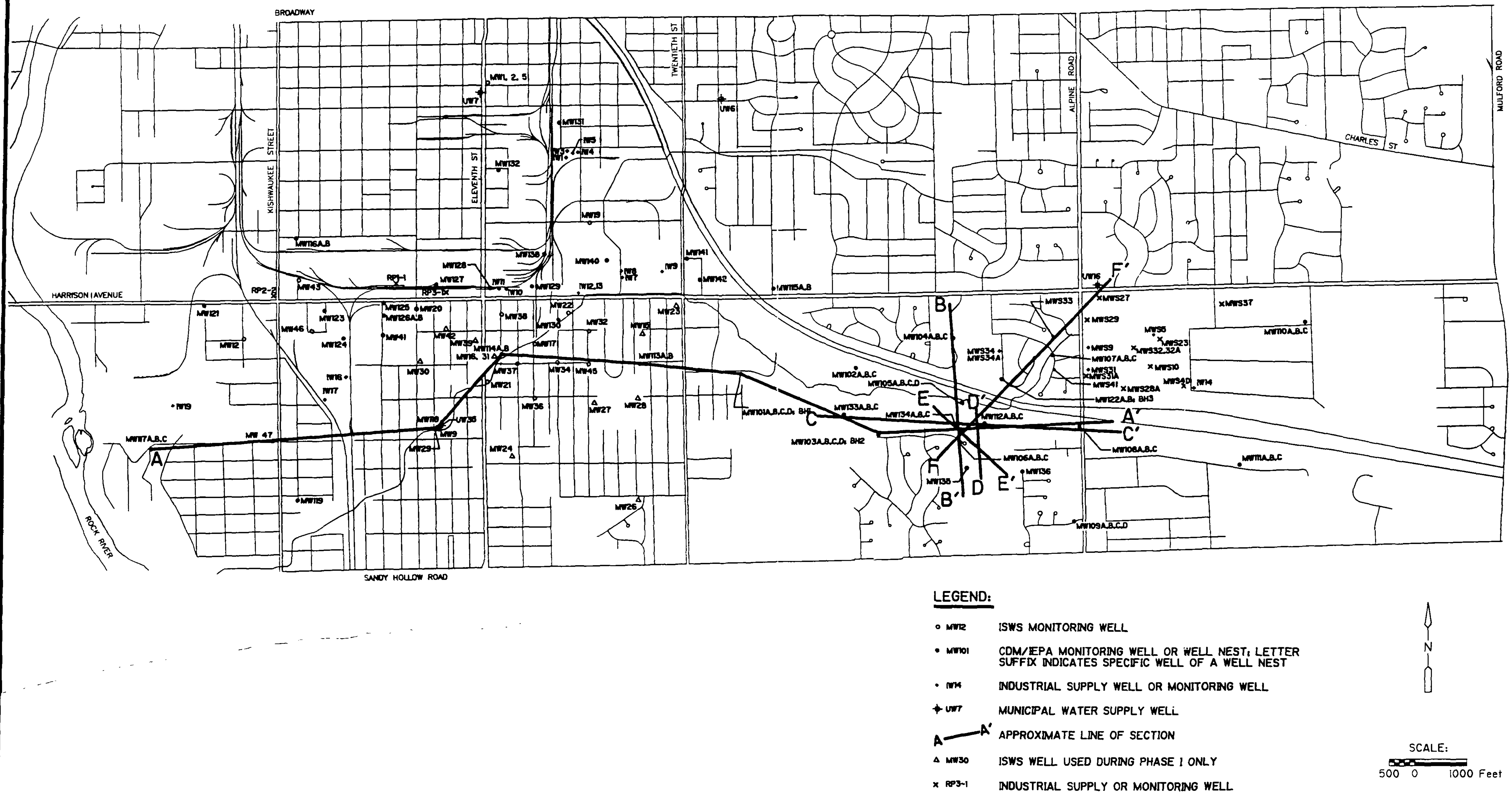


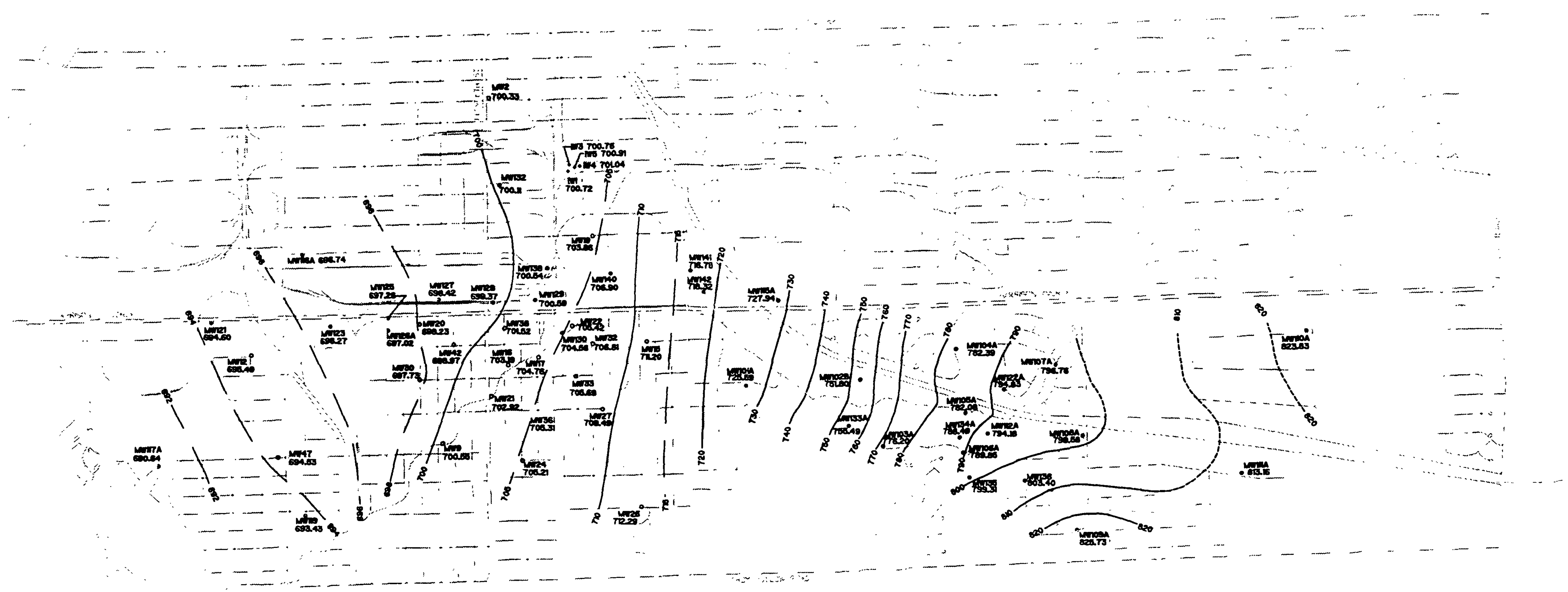

SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION STUDY

## LOCATIONS OF WELLS AND GEOLOGIC CROSS-SECTIONS

CDM
environmental engineers, scientists, planners, & management consultants

Figure No. 3-3

M. KUZEL, NMW-CHI 0:00:29 11/22/94 12:46:05 FIG3-11 I:\CAD\168\7\RI\RIRPT\



**LEGEND:**

- ∘ MW12 — ISWS MONITORING WELL
- • MW101A — CDM/IEPA MONITORING WELL
- · IW14 — INDUSTRIAL SUPPLY WELL OR MONITORING WELL
- 800 — GROUNDWATER ELEVATION CONTOUR
- 800 — INFERRED GROUNDWATER ELEVATION CONTOUR
- CONTOUR AT INTERVAL OF <10 FEET

**NOTE:**

MAP INCLUDES WELLS IN SHALLOW PORTION OF UNCONSOLIDATED AQUIFER, GENERALLY WITHIN 25 FEET OF WATER TABLE.

N

SCALE:
500 0 1000 Feet

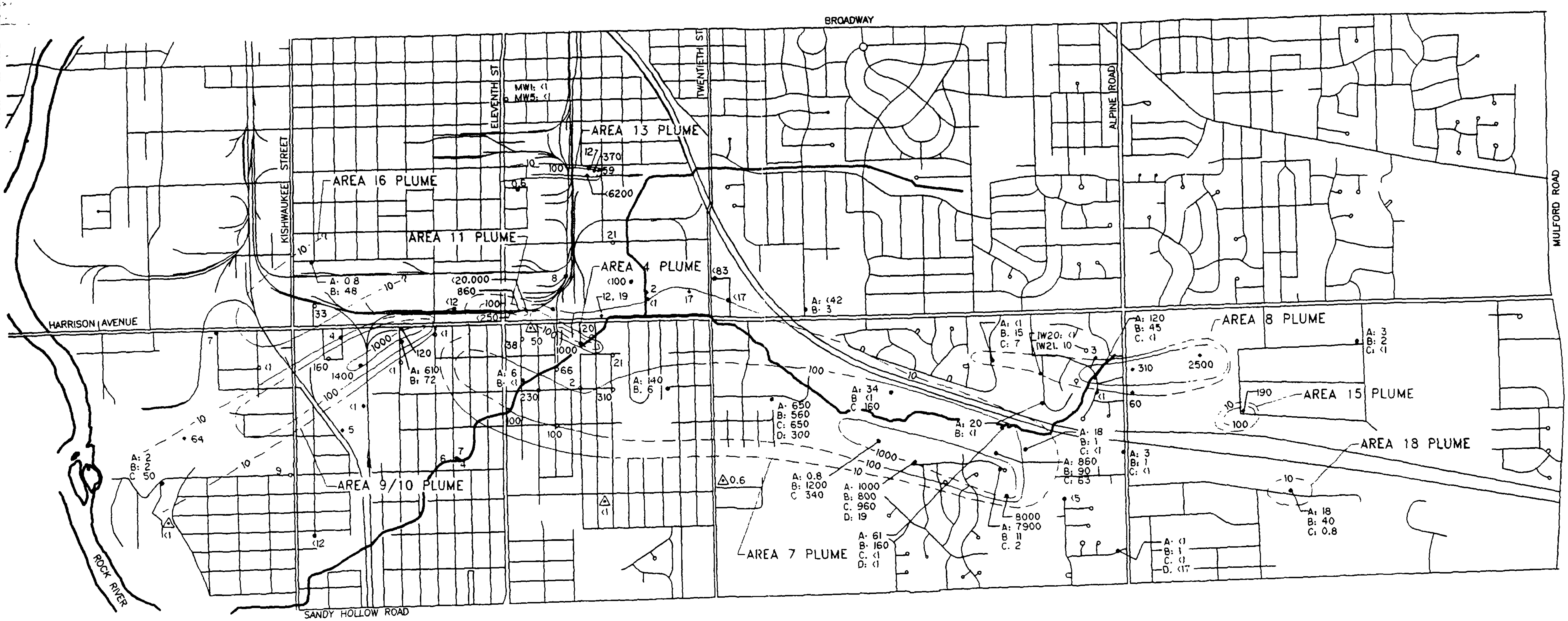
VARIABLE CONTOUR INTERVAL: 2, 5 OR 10 FE

SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION STUDY

## GROUNDWATER ELEVATIONS IN THE UNCONSOLIDATED AQUIFER, OCT. 26, 1993

CDM
*environmental engineers, scientists, planners, & management consultants*

FIGURE 3-11




N

NOTES:

1. TO REDUCE CLUTTER ON THE MAP, FULL WELL NAMES ARE NOT INCLUDED; REFER TO FIGURE 3-3 FOR WELL NAMES
2. CONTOURS ARE BASED ON MAXIMUM TCA CONCENTRATIONS AT A GIVEN WELL NEST.
3. MW114A AND B WERE NOT USED IN CONTOURING, BECAUSE THEY ARE SCREENED BELOW THE CONTAMINATED INTERVAL.

LEGEND:

| | |
|---|---|
| ∘ 21 | ISWS MONITORING WELL WITH TCA CONCENTRATION, ppb |
| • A: 140 B: 6 | CDM/IEPA MONITORING WELL NEST OR WELL WITH TCA CONCENTRATION, ppb; LETTER INDICATES SPECIFIC WELL OF A WELL NEST |
| • 60 | INDUSTRIAL SUPPLY WELL OR MONITORING WELL WITH TCA CONCENTRATION, ppb |
| △ <1 | SELECTED RESIDENTIAL WELL SAMPLING LOCATION (RESIDENTIAL WELL LOCATIONS, ADDRESSES AND COMPLETE RESULTS ARE GIVEN IN SECTION 6) |
| —100— | CONTOUR OF MAXIMUM TCA CONCENTRATION AT WELL NEST OR WELL LOCATION; DASHED WHERE INFERRED |

SCALE:
500 0 1000 Feet

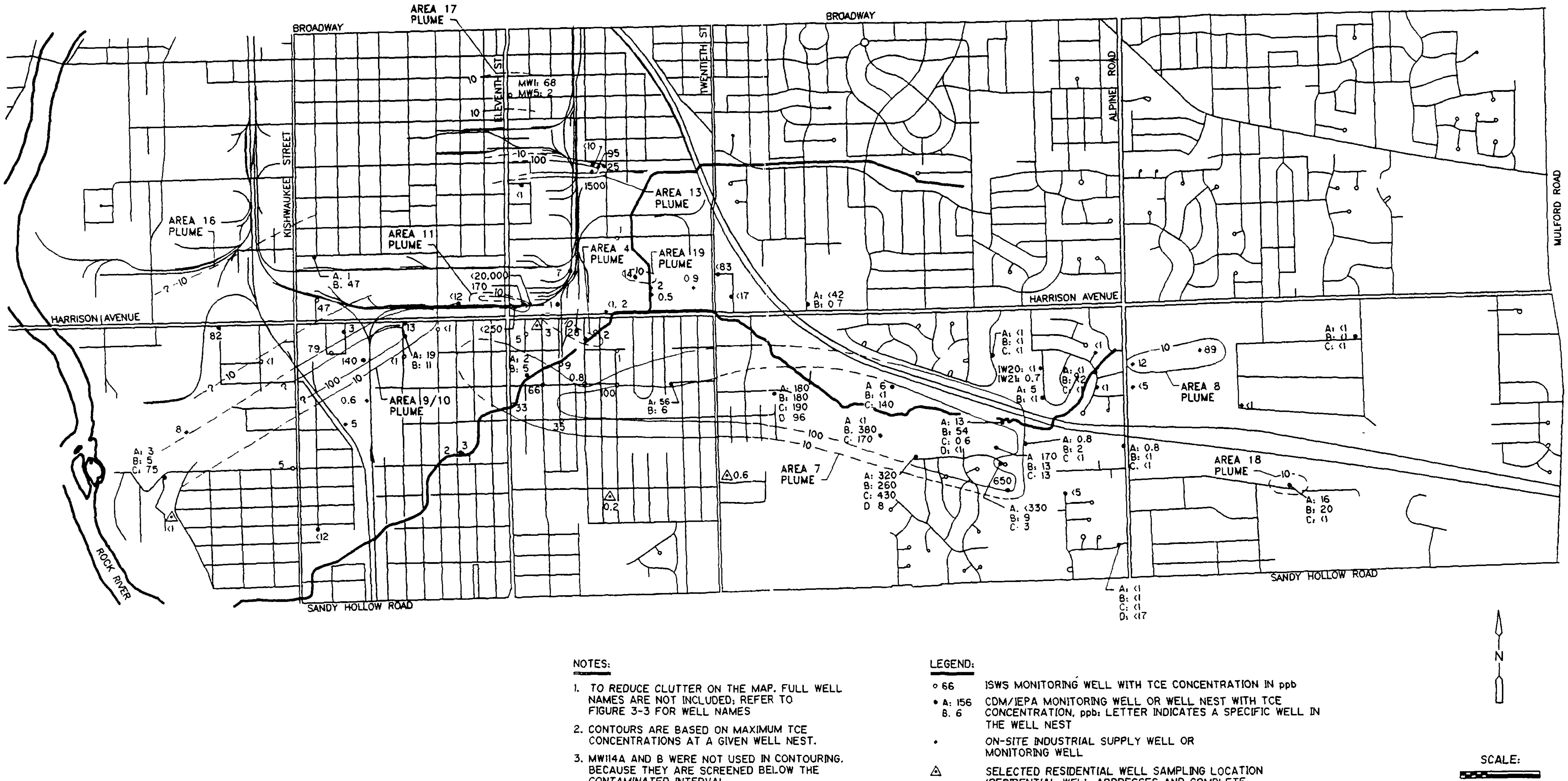
SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION STUDY

TCA IN GROUNDWATER
IN PHASE II SAMPLES

**CDM**
*environmental engineers, scientists, planners, & management consultants*

Figure No. 4-31

M. KUZEL, NMW-CHI 0:00:38 11/21/94 17:06:43 FIG4-33 I:\CAD\1681\7\RI\RIRPT\




NOTES:

1. TO REDUCE CLUTTER ON THE MAP, FULL WELL NAMES ARE NOT INCLUDED; REFER TO FIGURE 3-3 FOR WELL NAMES
2. CONTOURS ARE BASED ON MAXIMUM TCE CONCENTRATIONS AT A GIVEN WELL NEST.
3. MW114A AND B WERE NOT USED IN CONTOURING, BECAUSE THEY ARE SCREENED BELOW THE CONTAMINATED INTERVAL.

LEGEND:

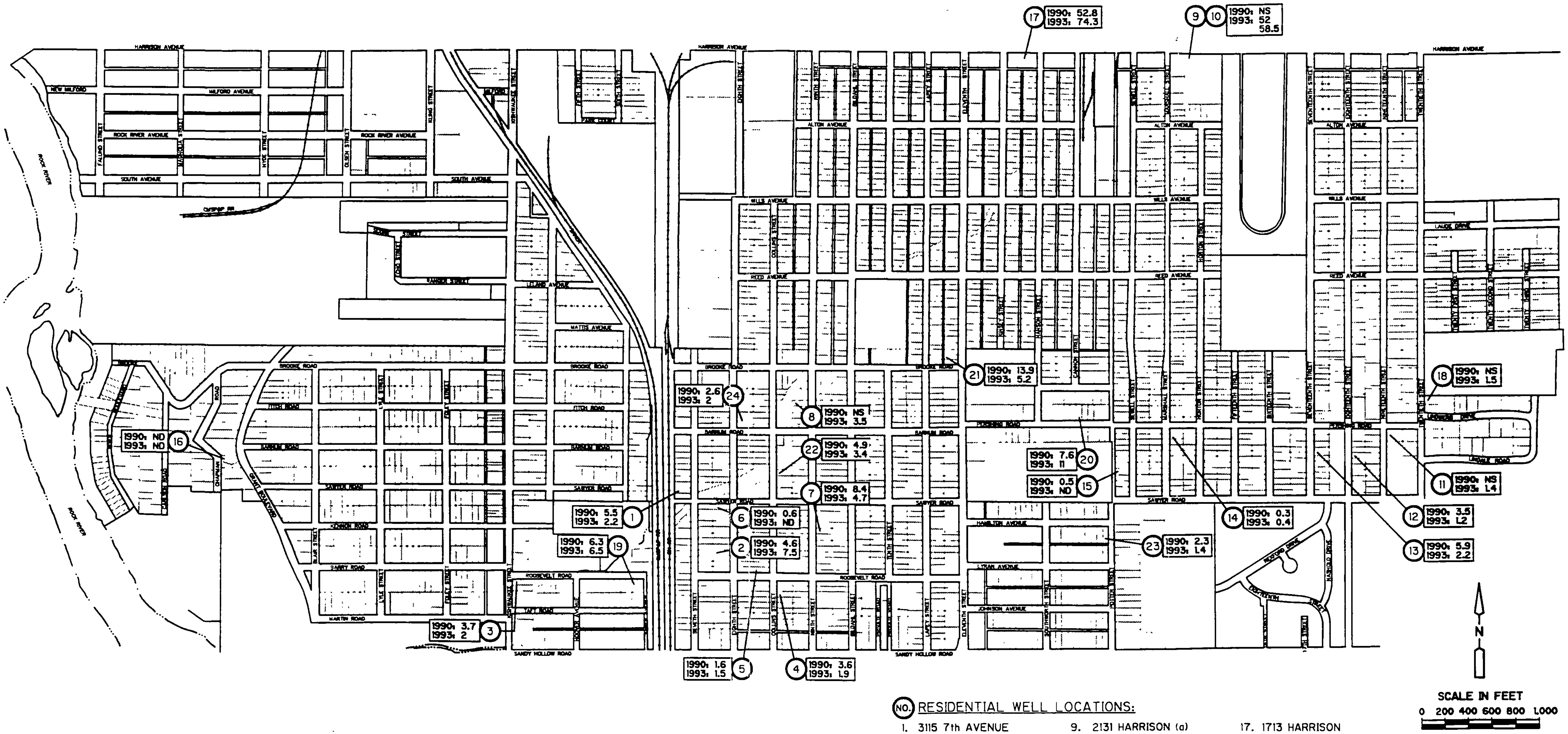
| | |
|---|---|
| ∘ 66 | ISWS MONITORING WELL WITH TCE CONCENTRATION IN ppb |
| • A: 156 B. 6 | CDM/IEPA MONITORING WELL OR WELL NEST WITH TCE CONCENTRATION, ppb; LETTER INDICATES A SPECIFIC WELL IN THE WELL NEST |
| • | ON-SITE INDUSTRIAL SUPPLY WELL OR MONITORING WELL |
| △ | SELECTED RESIDENTIAL WELL SAMPLING LOCATION (RESIDENTIAL WELL ADDRESSES AND COMPLETE RESULTS ARE GIVEN IN SECTION 6) |
| —100— | CONTOUR OF MAXIMUM TCE CONCENTRATION (ppb) AT WELL NEST OR WELL LOCATION; DASHED WHERE INFERRED |

**CDM**
environmental engineers, scientists, planners, & management consultants

SOUTHEAST ROCKFORD
GROUNDWATER CONTAMINATION STUDY

TCE CONCENTRATION (ppb) IN GROUNDWATER IN PHASE II SAMPLES

Figure No. 4-33




(NO.) RESIDENTIAL WELL LOCATIONS:

1. 3115 7th AVENUE
2. 3237 8th STREET
3. 3302 KISHWAUKEE
4. 3310 COLLINS
5. 3245 COLLINS
6. 3201 8th STREET
7. 3218 9th STREET (1990 DATA COLLECTED FROM 3210 9th ST.)
8. 3021 9th STREET
9. 2131 HARRISON (a)
10. 2131 HARRISON (b)
11. 3112 19th STREET
12. 3110 18th STREET
13. 3118 17th STREET (1990 DATA COLLECTED FROM 3120 17th ST.)
14. 3106 MARSHALL
15. 3131 SEWELL (1990 DATA COLLECTED FROM 3135.5 SEWELL)
16. 3107 GRANT BLVD.
17. 1713 HARRISON
18. 3024 20th STREET
19. 841 ROOSEVELT
20. 1716 PERSHING
21. 2955 11th STREET
22. 3126 COLLINS
23. 1735 HAMILTON
24. 3028 8th STREET (1990 DATA COLLECTED FROM 3022 8th ST.)

SOUTHEAST ROCKFORD GROUNDWATER CONTAMINATION STUDY

## RESIDENTIAL WELL SAMPLING LOCATIONS TOTAL VOLATILE ORGANIC COMPOUNDS DETECTED IN 1990 AND 1993 (ppb)

CDM
environmental engineers, scientists, planners, & management consultants

Figure No. 4-27

# APPENDIX D

# REFERENCE DOCUMENTS

ECOLOGY AND ENVIRONMENT INC. TELECON MEMO

| | |
|---|---|
| Date: 6-7-95<br>Time: 1300 | With: TERPIN, William Ballard Phone:<br>Of: U.S. EPA - R.P.M - SRGC |
| By: D. Robin<br>cc: File | E & E Project #: ZT3051<br>Site Name: Rexnord Inc Rockford Products Ph3<br>File Location: Telecom |

Mr. Ballard informed me that the SRGC site is a state lead NPL site. Rockford Products was not named as a PRP for the site and is not considered ~~a~~ a source of the VOC plume. He mentioned the presence of minor surficial contamination and was vaguely aware of the contractor study (M. Rapps) of the site. I explained the FSIP for the site to him he said it should probably be NFRAPed.

Donovan Robin 6.7.95

| ECOLOGY AND ENVIRONMENT INC. | TELECON MEMO |
|---|---|
| Date: 7-18-95<br>Time: 11:15 | With: Roy Morris Phone: 815-397-6000<br>Environ Affairs Manager<br>Of: Rockford Products |
| By: Donovan Robin<br>cc: Site file | E & E Project #: ZT3051<br>Site Name: Rexnord, Inc<br>File Location: telecon |

I ASKED MR. MORRIS IF Any MATERIALS (soil) was dredged or removed in 1991 when the seepage pond was closed, he said no.

I Asked if any sampling was done he said no and explained that the area was simply sodded over, no backfilling or dredging was needed.

I Asked if the roof-mounted TCA tank has been removed, He corrected me, and informed me that the tank was an UST, the vent for the tank was roof-mounted, the vent is where the release had occurred. He informed me that the tank was removed several years ago but could not remember when.

Donovan Robin 7-18-95

| ECOLOGY AND ENVIRONMENT INC. | TELECON MEMO |
|---|---|
| Date: 7-18-95<br>Time: 1040 | With: JACK Adam Phone: 815-987-7760<br>Of: IEPA - Environ. Protection Specialist |
| By: D. Robin<br>cc: File | E & E Project #: 2T3051<br>Site Name: Rexnord, Inc.<br>File Location: telecom - FSIP |

I gave Mr. Adam the name and NPDES permit number for the Rockford Products Corp. Plant #3 (NPDES = IL0067989) he checked the file and informed me that they have had no violations of this permit and were nominated for an Award of Excellence for their pre-treatment plant.

Donovan Robin 7-18-95

ECOLOGY AND ENVIRONMENT INC. TELECON MEMO

| | |
|---|---|
| Date: 7-18-95<br>Time: 1050 | With: Tom Walsh Phone: 815-987-7760<br>Of: IEPA - Bureau of Air |
| By: Donovan Robin<br>cc: | E & E Project #: ZT3051<br>Site Name: Rexnord, Inc.<br>File Location: telecom - FSIP |

I asked Mr. Walsh if he is aware of any violations of Air permits at the Rexnord site. He said the site is a minor source, IEPA rarely inspects it, However, he has been there. He is not aware of any problems at the site and is certain that there are no on-going problems or repeated violation.

Donovan Robin 7-18-95

Rockford

Rockford Products Corporation
707 Harrison Avenue
Rockford Illinois 61104-7197
(815) 397-6000

June 14, 1995

Ecology & Environment
111 West Jackson Blvd.
Chicago, Illinois 60604

Attention: Mr. Donovan Robin

Subject: **ROCKFORD PRODUCTS CORPORATION SEEPAGE POND**

Dear Mr. Robin:

Prior to 1991, Rockford Products Corporation maintained an on-site seepage pond for disposal of non-contact cooling water and storm water. This pond was most recently authorized under permit number 1989-EO-3687-2.

In June of 1991, a new storm sewer connected to the city of Rockford Storm Sewer System was completed and all discharge waters were diverted permanently from the pond to the new sewer. Discharge of non-contact cooling water to this sewer was authorized under permit number IL0067989. Since that time, no waters have been discharged to the former pond.

Sincerely yours,

ROCKFORD PRODUCTS CORPORATION

Roy Morris

Roy W. Morris
Manager Environmental Affairs

RWM/nc

| ECOLOGY AND ENVIRONMENT INC. | TELECON MEMO |
|---|---|
| Date: 6-8-95<br>Time: 1000 | With: Nancy Cole Phone: ~~Em~~ 815-397-600<br>Of: Rocford Products |
| By: D. Robin<br>cc: File | E & E Project #: ZT3051<br>Site Name: Rexnord / Rockford Products<br>File Location: |

Ms. cole informed me that the entire plant is fenced and 24 hr. security provided. The seep pond has been closed and runoff is diverted to a city sewer. this was done in 1991 ~~Sto~~ discharge consists of storm water / non-contact cooling water and is under a Permit NPDES. Will provide written documentation.